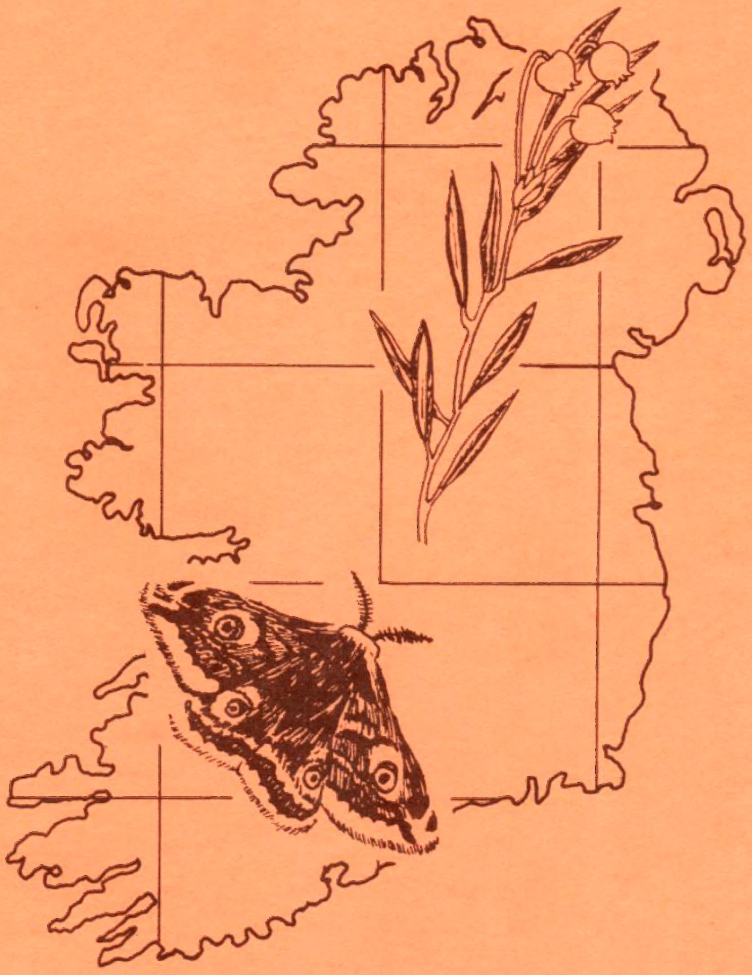
IRISH BIOGEOGRAPHICAL SOCIETY



Bulletin No. 11

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EDITORIAL

This year, the number of manuscripts submitted for publication in Bulletin No. 11 exceeded all our expectations. It has been necessary therefore to divide the accepted papers between Bulletins No. 11 and No. 12. The latter is currently in production and will be published in early 1989. It will be available to the 1989 subscribers. On behalf of The Irish Biogeographical Society, I wish to thank Dr. A. McNally, Assistant Editor, the members of the Editorial SubCommittee and General Committee, and all those who have contributed so much towards the continuing success of the Bulletin. Manuscripts which authors wish to have considered for publication in Bulletin No. 13 should be submitted before 1st September 1989.

J. P. O'Connor,
Editor.

Bull. Ir. biogeog. Soc. No. 11 (1988)

MYCETOBIA OBSCURA MAMAEV (DIPTERA: ANISOPODIDAE), A SPECIES NEW TO IRELAND AND A FIRST RECORD FOR THE BRITISH ISLES.

Patrick Ashe

Introduction

A review of the family Anisopodidae in Ireland has recently been published (Ashe, 1987) but in that review only one member of the genus Mycetobia, M. pallipes Meigen, has been reported as occurring in Ireland. While collecting data on the distribution of Anisopodidae in Ireland for that review, no new material of Mycetobia was found and the records of M. pallipes in Ireland given (Ashe, op. cit.) were based on the concept of M. pallipes applied by the 19th century Irish entomologist A. H. Haliday. Until 1968 it was believed that only one species of Mycetobia, M. pallipes, existed in the Palaearctic and consequently all records of the genus in the Palaearctic were assigned to that species.

Mamaev (1968) described four new species of Mycetobia from the USSR and in a subsequent paper (Mamaev, 1971) added two more new species, bringing the total number of species to seven in the western Palaearctic.

During 1986 and 1987 I was still searching for Mycetobia adults and immature stages in order to confirm the presence of M. pallipes in Ireland. However, the result was somewhat unexpected and a different species, M. obscura Mamaev, was discovered from two localities. This discovery caused some doubt as to whether or not the Haliday records of M. pallipes in Ireland (Ashe, 1987) were correct. The only extant Haliday specimen in Ireland is an adult female and there are no keys for identifying the females of the various species. However, the question as to the occurrence in Ireland of M. pallipes was resolved with the finding of a male adult by Mr. P. J. Chandler in Co. Westmeath.

REVISED CHECKLIST OF IRISH ANISOPODIDAE

(* = species new to Ireland)

Sylvicola cinctus (Fabricius, 1787)
S. fenestralis (Scopoli, 1763)

S. punctatus (Fabricius, 1787)
S. zetterstedti (Edwards, 1923)
*Mycetobia obscura Mamaev, 1968
M. pallipes Meigen, 1818

For all following records the Irish national grid reference (six or four figure reference) is given followed by the Universal Transverse Mercator (UTM) 50 km grid reference in parenthesis.

Mycetobia obscura Mamaev

Offaly: 1 February - 9 March 1987, Charleville Wood, N320225 (NV.4) leg. and det. P. Ashe, reared from Quercus rot-hole material collected on 14 October 1986.

Wicklow: 28 March 1987, Glen of the Downs, O2611 (PU.3), leg. M. C. D. Speight, det. P. Ashe, reared from Quercus rot-hole material collected on 5 March 1987.

This species was first described by Mamaev (1968) based on adults reared from larvae which were living in damp decomposing timber in rotting tree stumps from two localities near Moscow, in the USSR. This species was subsequently reported as occurring in Denmark and Sweden by Hutson and Vane-Wright (1969), based on information from Dr. B. V. Pedersen. Locality details and ecological information for M. obscura and other Mycetobia species in Scandinavia were subsequently published by Pedersen (1971).

The Irish specimens from Charleville Wood were reared from a sample of material (detritus, leaves, water, etc.) collected from a wet rot-hole in a living specimen of Quercus. Several males and one female hatched from the sample. The empty pupal exuviae were easy to locate on the walls of the glass rearing jar or protruding from the rot-hole medium. The cast larval exuviae were not located because this would cause too much disturbance to the remaining living larvae. However, some mature larvae were preserved in order to provide material for an eventual description. This sample still contains living Mycetobia larvae and should produce more adults during February and March 1988.

The present record of M. obscura from Ireland is the first record of an anisopodid new to the British Isles in over 60 years. M. obscura is now

known from Denmark, Ireland, Sweden and the USSR but it must be more widely distributed in Europe. Why has this species been missed by most collectors? The answer is not certain but it seems to be a combination of the following factors: (i) the adult stage of M. obscura in nature is probably only found during Spring and early Summer before most collectors are active and (ii) the rot-hole habitat is rarely sampled or investigated closely by most entomologists.

A single pinned male of M. obscura has been deposited in the National Museum of Ireland. All the remaining material is preserved in alcohol or has been slide mounted and has been retained in the author's collection.

Mycetobia pallipes Meigen

Westmeath: 28 June 1987, Lough Ballynafid, N4160 (PV.2), leg, and det. P. J. Chandler, 1♂ adult.

The Haliday records from Co. Cork and Co. Kerry referred to in Ashe (1987) are still regarded as belonging to M. pallipes even though no extant male specimens have been found. Records from Great Britain (Chandler, pers. comm.) show that M. pallipes is most commonly found as an adult during the months of June, July and August whereas M. obscura seems to be a Spring - early Summer emerging species. The Co. Cork and Co. Kerry records are from July and August respectively.

Haliday did exchange material with contemporary entomologists (O'Connor and Nash, 1982) and it is possible that Irish material of M. pallipes may exist in other European museums.

Acknowledgements

I wish to thank Mr. P. J. Chandler, Weston Research Laboratories Ltd., Maidenhead, England for permission to include the M. pallipes record from Co. Westmeath and Dr. M. C. D. Speight, Wildlife Service, Bray for the M. obscura specimen from Co. Wicklow.

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NEW RECORDS OF MARINE HALACARIDAE (ACARI: PROSTIGMATA) FROM ROCKY SHORES AROUND THE IRISH COAST.

Paul Somerfield

Abstract

During a survey of the Halacaridae (Acari) living among algae, barnacles, mussel clumps, lichens and other substrata on rocky shores around the coast of Ireland samples were taken from thirty-one sites. Twenty nine species of halacarids were present in these collections. Of these seven species are new to Ireland, namely Isobactrus levis (Viets), Isobactrus ungulatus Bartsch, Metarhombognathus nudus (Viets), Rhombognathides spinipes (Viets), Rhombognathus subtilis Bartsch, Agauopsis tricuspis Benard and Lohmannella kervillei (Trouessart). The variety Rhombognathides merrimani needleri Newell is also new to Ireland.

Introduction

Brady (1875) was the first to record halacarid mites from Ireland. As a part of the Clare Island Survey Halbert (1915) published several records of species occurring not only in the survey area but also elsewhere on the Irish coast. Some of the records in this paper result from a survey of Blacksod Bay published earlier in the year (Farran, 1915). Halbert augmented his work on the marine Acari with a later paper in 1920 but published no further records of Halacaridae after that date. In all he recorded some twenty species of halacarids, including three new to science.

No further work was done on the family Halacaridae in Ireland until the late 1970s when halacarids were collected from the Strangford Narrows and the Irish Sea during a study of mesopsammal gastropods (Poizat, 1979). These were eventually determined by Bartsch (1985) bringing the total Irish halacarid fauna to forty-one species. Some new records are to be found in Green and MacQuitty (1987).

Due to their small size halacarids cannot be collected directly in the field. Instead substrates are collected and the fauna is extracted later. The methods used were adapted from those of Pugh and King (1985), using a

hypersaline solution to float the mites out of the substrate. Specimens were then fixed in Koenike's fluid for two weeks, cleared in lactic acid and temporarily mounted in lactic acid for examination. The data for each collection are given as follows:

No. Vice-County Site Name Grid Ref.
Ecological notes and collection details.

In the discussion of the species found in these collections each collection will be referred to by its number alone.

Literature used in the identification of specimens included André (1946), Bamber (1982), Bartsch (1976, 1977a, 1977b, 1979b, 1985), Green (1960), Newell (1947), Pugh (1985) and Viets (1927). Especially useful was the recent synopsis of the British Halacaridae by Green and MacQuitty (1987) and the nomenclature in this papers follows their usage. Voucher specimens will be deposited in the National Museum of Ireland.

Collections

1. Down (38) Ballyquintin Point J6245
A semi-exposed shore on the southern tip of the Ards peninsula. Algae, sponges and other sessile animals were collected from a rocky area. 15.x.1986.

2. Down (38) Cloghy Rocks J5949
A sheltered shore. Fucoids and other algae were collected from rocks set in muddy sediments. Some sediments were also collected. 1.viii.1986

3. Down (38) Kilclief J5948
Fucoids and Zostera were collected from the lower half of the shore. This site was sheltered, very muddy and influenced by freshwater from a small stream which flows down the shore. 1.viii.1986.

4. Down (38) Angus Rocks J5948
Fucoids, other algae and barnacles were collected from rocks set in muddy sediments. A sheltered shore. 1.viii.1986.

5. Dublin (21) Scotsman's Bay 02528
A semi-exposed rocky shore with a North-easterly aspect. Algae, barnacles, lichens and mussels were collected on several occasions. 6.iv.1986: 5.vi.1986: 12.viii.1986: 24.ix.1986

6. Dublin (21) Dalkey Island O2826
Algae, hydroids and bryozoans were collected from depths down to 9m, using S.C.U.B.A., mainly from a Laminaria digitata "forest" in a sheltered cove not exposed to the fierce currents found elsewhere in the area. 19.viii.1986

7. Wexford (12) Carnsore Point T1203
Algae and barnacles were scraped off boulders and outcrops on a very exposed rocky shore with a south-westerly aspect. 29.vii.1986

8. Wexford (12) Slade S7598
A very exposed rocky shore with a south-easterly aspect with large areas of bare rock. Algae, barnacles and clumps of mussels were collected. 29.vii.1986

9. Wexford (12) Hook Head S7397
An extremely exposed rocky shore subjected to the full force of the prevailing winds and swell. The rock is devoid of fucoids and largely bare, but lichens, mussels, barnacles and some algae were collected. 29.vii.1986

10. West Cork (3) Courtmacsherry Bay W5243
Mussels and algae were collected from mussel beds on a sandy beach on the eastern side of the bay. 14.vii.1986

11. West Cork (3) Ring Head W3842
An exposed shore with outcrops of weathered rock with many pools and pockets of sand. Algae and mussel clumps were collected. 14.vii.1986

12. West Cork (3) Glengarriff V9355
A collection was made in the "Blue Pool", an extremely sheltered shore subject to no wave action whatsoever but somewhat influenced by freshwater from a nearby stream. Fucoids and other algae were collected. 15.vii.1986

13 South Kerry (1) Annascaul Q0062
A semi-exposed rocky shore near the mouth of a stream. Various algae and barnacles were collected. 21.ix.1986

14. North Kerry (2) Tarbert R0849
Fucoids were collected from the pier near the terminal of the Tarbert Ferry. A sheltered site in the estuary of the Shannon. 16.vii.1986

15. Clare (9) Kilkee Q8860
Algae, lichens and barnacles were collected from an exposed limestone shore on the southern side of Kilkee bay. 16.vii.1986.

16. Clare (9) Black Head M1114
An extremely exposed limestone shore. Algae, lichens, mussels and barnacles were collected. 16.vii.1986

17. Clare (9) Muckinish Bay M1127
An extremely sheltered shore of stones and muddy sand. Fucoids, other algae and sponges were collected. 18.vii.1986

18. South East Galway (15) Aughinish Bay M3313
An extremely sheltered shore of rocks amongst mud near the tide mill. Fucoids and other algae were collected. 27.i.1986

19. South East Galway (15) Kilcolgan Point M3019
A semi-exposed shore, mainly of shingle from which fucoids are harvested for fertiliser. Some fucoids were collected. 11.iv.1986

20. South East Galway (15) Ardfry M3521
An extremely sheltered shore with algae growing on stones set in sand. Fucoids and other algae were collected. 12.iv.1986

21. West Galway (16) Greatman's Bay L9211
An exposed rocky shore with a south-westerly aspect. Algae were collected. 28.i.1986

22. West Mayo (27) Emlagh Point L7481
An extremely exposed shore of a very hard quartz-like rock weathered to a very smooth finish to the south of Roonagh Quay. Algae mainly occurred in shallow pools and between boulders. Algae were collected. 19.vii.1986

23. West Mayo (27) Clew Bay L9093
An extremely sheltered shore of stones and mud. Fucoids and sponges were collected. 19.vii.1986.

24. West Mayo (27) "Purteen" F0362
An extremely exposed rocky shore with a south-westerly aspect 50m west of the small harbour on the southern shore of Achill Island. Algae and mussel clumps were collected. 7.ix.1986

25. West Mayo (27) Purteen F0362
A collection of algae was taken from the innermost part of the small fishing harbour. The shore was extremely sheltered and consisted of a south-facing slope of mud and stones. 10.ix.1986

26. West Donegal (35) Rusheen Park G5978
The site was beside a small pier on the western side of the estuary and greatly influenced by freshwater from the river. A cover of fucoids lay over mud. Algae, mainly fucoids, were collected. 22.viii.1986

27. West Donegal (35) Malin Beg G4980
A semi-exposed shore near the pier within the inlet. Algae, mussels and barnacles were collected. 23.viii.1986

28. West Donegal (35) Dungloe B7512
A very sheltered shore of rocks and mud. Algae were collected from a large block of rock about 100m from the mouth of a stream. 23.viii.1986

29. West Donegal (35) Bloody Foreland B8134
An extremely exposed shore with a westerly aspect. Algae, mussels and barnacles were collected. 23.viii.1986

30. West Donegal (35) Fanad Head C2348
A mixed shore, predominantly exposed but due to the rough nature of the rock there were many sheltered pockets and pools. Algae, lichens, mussels and barnacles were collected, as much as possible from the exposed parts of the shore. 24.viii.1986

31. West Donegal (35) Mulroy Bay C1842
An extremely sheltered site on the Western shore of the North Water. Algae were collected. 24.viii.1986.

Results

Subfamily RHOMBOGNATHINAE Viets

Isobactrus levis (Viets) 1927.

Survey records: 8, 26

Only two specimens were found, both in the upper intertidal zone. The Wexford specimen was found in *Enteromorpha* growing in a freshwater seep in the splash zone and the Donegal specimen in *Pelvetia canaliculata*.

This species is new to Ireland but is recorded as occurring in Wales, the North and Baltic Seas, Brittany and Eastern North America (Green and MacQuitty, 1987).

Isobactrus setosus (Lohmann) 1889

Survey records: 1, 2, 5, 10, 11, 14, 15, 16, 17, 19, 20, 21, 25, 26, 27, 28, 29, 31.

I. setosus is widespread in Ireland. It was found to be most abundant on, but not restricted to, sheltered shores. It was generally found on fucoids such as Pelvetia canaliculata and Fucus spiralis and green algae such as Enteromorpha on the upper parts of the seashore but was found to occur at all levels on the shore, and even in the shallow sublittoral, on a range of substrata including barnacles, Lichina pygmaea, mussels and Zostera marina. Halbert (1915) found this species on Clare Island, Co. Mayo. Green and MacQuitty (1987) record it as occurring in Bangor, Co. Down. It is also recorded from Britain, Brittany, the North and Baltic Seas and from the Atlantic coast of North America (Green and MacQuitty, 1987).

Isobactrus ungulatus Bartsch, 1975

Survey records: 1, 2, 4, 5, 7, 8, 9, 13, 16, 27, 30.

This species was commonly found among barnacles and Lichina pygmaea and also on algae, generally on the upper part of the seashore. It is not previously recorded from Ireland but occurs on the south and west coasts of Great Britain and on the French Atlantic coast (Green and MacQuitty, 1987).

Metarhombognathus armatus (Lohmann) 1893

Survey records: 1, 2, 3, 4, 5, 8, 9, 11, 15, 20, 24, 29, 30

M. armatus was found to be locally abundant. It was generally taken from Porphyra umbilicalis but also occurred on a wide range of substrata including fucoids, barnacles, Lichina pygmaea and clumps of mussels. Bartsch (1985) recorded this species from the Strangford Narrows. It is known to be widespread on the coasts of Great Britain (Green and MacQuitty, 1987), Europe from France as far north as Norway and on the eastern coasts of North America (Bartsch, 1979a).

Metarhombognathus nudus (Viets) 1928

Survey records: 7, 8, 15

This species was locally abundant among barnacles but also occurred on Laurencia pinnatifida, Lichina pygmaea, Porphyra umbilicalis, Corallina officinalis and in clumps of mussels. It is not previously recorded as occurring in Ireland. It is known to occur in Great Britain (Green and MacQuitty, 1987; Pugh and King, 1985). Elsewhere it is known from Murmansk, Greenland and the east coast of North America (Green and MacQuitty, 1987).

Rhombognathides merrimani merrimani Newell, 1947

Survey records: 2, 10, 18, 20

This variety of R. merrimani Newell was found on fucoids, among mussels and in coarse sediments below algae. Bartsch (1985) recorded it as occurring in the Strangford Narrows.

Rhombognathides merrimani needleri Newell, 1947

Survey records: 2, 11, 12, 14, 16, 17, 19, 20, 24, 29, 31

R. merrimani needleri occurred on F. spiralis and other algae and also among mussels and coarse sediments below algae, most commonly on the upper parts of the seashore. This variety is not previously recorded from Ireland. R. merrimani is widespread in Britain (Green and MacQuitty, 1987) and elsewhere occurs on the coast of Europe from France as far north as Norway and on the eastern coast of the United States (Green and MacQuitty, 1987; Newell, 1947).

Rhombognathides mucronatus (Viets) 1927

Survey records: 2, 5, 8, 10, 12, 13, 14, 15, 16, 17, 20, 23, 24, 27, 29, 30

This species is widely distributed in Ireland. It was usually found on fucoids and other algae on the mid-shore, but also occurred among mussels and barnacles. Previous Irish records are from the Strangford Narrows (Bartsch, 1985) and Bangor, Co. Down (Green and MacQuitty, 1987). Its distribution is similar to that of R. merrimani and M. armatus (Bartsch, 1985).

Rhombognathides pascens (Lohmann) 1889

Survey records: 1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 22, 23, 24, 25, 27, 28, 29, 30, 31

This species was found to be widespread and abundant, generally being found on algae. It occurred at all levels on the shore and in the shallow sublittoral but was most numerous on the lower shore. Halbert (1915) recorded R. pascens from Clare Island and Blacksod Bay, Co. Mayo and "at counties Dublin and Cork". Bartsch (1985) identified it from the Strangford Narrows. Widespread in Britain it is also known from the eastern and western Atlantic coasts, North Africa, the Black Sea and the Red Sea (Bartsch, 1985; Green and MacQuitty, 1987).

Rhombognathides seahami (Hodge) 1860

Survey records: 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 16, 17, 18, 20, 21, 22, 23, 24, 25, 27, 28, 27, 29, 30, 31

R. seahami was found to be widespread and often abundant on algae from all levels on the seashore. It was also found among mussels, barnacles and coarse sediments. Halbert (1915) found this species at Howth and Sandycove, Co. Dublin; Blacksod Bay and on Clare Island, Co. Mayo. Bartsch (1985) identified it from the Strangford Narrows. It is widespread in Britain (Green and MacQuitty, 1987) and on coasts all around the North Atlantic (Bartsch, 1985).

Rhombognathides spinipes (Viets) 1933

Survey records: 14, 20

This species was found on F. spiralis and in coarse sediments beneath algae. It is not previously recorded from Ireland. It occurs in Britain and on the coasts of Europe from Novaya Zemlya to the French Atlantic coast (Green and MacQuitty, 1987; Pugh and King, 1985).

Rhombognathus notops (Gosse) 1855

Survey records: 1, 2, 3, 4, 5, 9, 10, 12, 14, 15, 16, 17, 20, 23, 24, 27, 28, 29, 30, 31.

Common on the coasts of Ireland, R. notops was recovered from algae at all

levels of the shore, also on sponges, among barnacles and mussels and in Lichina pygmaea. Halbert (1915) found this species on Clare Island and Bartsch (1985) recorded it from the Strangford Narrows. It is widespread in Britain and elsewhere on the coasts of the eastern North Atlantic (Bartsch, 1985; Green and MacQuitty, 1987)

Rhombognathus subtilis Bartsch, 1975

Survey record: 21

One specimen was found on F. spiralis. This species is new to Ireland. It is known from Britain, the French Atlantic coast and from Norway (Green and MacQuitty, 1987).

Subfamily HALACARINAE Viets

Agauopsis brevipalpus (Trouessart) 1889

Survey records: 9, 16

A. brevipalpus was found in clumps of mussels and among barnacles. Halbert (1920) recorded this species from Malahide, Co. Dublin. This species is recorded from both the North and South Atlantic oceans, the Mediterranean and the Black Sea. It is also recorded from Bengal and Australia but these records are doubtful (Viets, 1956; Green and MacQuitty, 1987).

Agauopsis tricuspis Benard 1962

Survey records: 8, 9, 13

This species was found in the upper intertidal among barnacles and in clumps of mussels. It is not previously recorded from Ireland. It is known to occur in Britain, on the French coast and in the northern Adriatic (Green and MacQuitty, 1987; Pugh and King, 1985).

Copidognathus fabricii (Lohmann) 1889

Survey records: 2, 4, 5, 10, 17, 20

C. fabricii was generally found on algae and sponges, and in sediments below algae, on the lower shore. Halbert (1915) recorded this species from Blacksod Bay, Co. Mayo; Ardfry, Co. Galway; Malahide and Howth, Co. Dublin.

Bartsch (1985) identified it from the Strangford Narrows. It is widespread in Britain (Green and MacQuitty, 1987). It is known to occur all around the North Atlantic and in the Mediterranean and Black Seas (Bartsch, 1985; Viets, 1956).

Copidognathus lamellosus (Lohmann) 1893

Survey record: 2

A specimen was taken from sediments beneath Fucus serratus. Halbert (1915) recorded this species as C. tabellio (Trouessart) from Malahide, Co. Dublin. C. tabellio is a synonym of C. lamellosus (Bartsch, 1979b). Bartsch (1985) identified this species from the Strangford Narrows and the nearby Irish Sea. It occurs in Britain, elsewhere along the north-eastern coast of the North Atlantic and in the Mediterranean (Green and MacQuitty, 1987; Bartsch, 1985).

Copidognathus oculatus (Hodge) sensu Lohmann, 1889

Survey records: 6, 9, 11, 16, 24, 30, 31

This species was found on a range of algae and other substrata including mussels, barnacles and Zostera marina. It was generally found below the mid-shore and in the sublittoral. Halbert (1915) found it in Blacksod Bay, Co. Mayo; Kinsale Harbour, Co. Cork and the Malahide Inlet, Co. Dublin. Bartsch (1985) identified it from the northern Irish Sea. It occurs in Britain and along the European coast from the Black Sea to the Arctic (Bartsch, 1985; Green and MacQuitty, 1987).

Copidognathus remipes (Trouessart) 1894

Survey record: 9

One specimen was recovered from Corallina, Enteromorpha and other algae in a rockpool. Bartsch (1985) identified this species from the northern Irish Sea. Elsewhere it is known from the Mediterranean and the Atlantic coast of Europe (Bartsch, 1985).

Copidognathus reticulatus (Trouessart) 1893

Survey records: 6, 31

This species was found on laminarians and other algae in the shallow sublittoral. Bartsch (1985) identified this species from the northern Irish Sea. Green and MacQuitty (1987) record it as occurring in the Isle of Man. Elsewhere it is known from the Arctic part of the North Atlantic (Bartsch, 1985).

Copidognathus rhodostigma (Gosse) 1855

Survey records: 2, 10

C. rhodostigma was found in coarse sediments beneath Fucus serratus and among mussels. Halbert (1915) gives localities at Blacksod Bay, Co. Mayo Valencia Harbour, Co. Kerry and Kinsale Harbour, Co. Cork. Bartsch (1985) identified it from the Strangford Narrows and the north Irish Sea. It is common in Britain and on the coast of Europe (Bartsch, 1985; Green and MacQuitty, 1987) and also occurs in the Mediterranean and the Black Sea (Viets, 1956).

Halacarus actenos Trouessart, 1889

Survey records: 4, 5

This species was taken from algae, barnacles and Halichondria on the lower shore. Halbert (1915) recorded it from Clew Bay and Blacksod Bay, Co. Mayo and from Portmarnock, Co. Dublin. Green and MacQuitty (1987) record it from Lough Hyne, Co. Cork. It occurs in Britain, on the coasts of Europe, Florida, Cape Verde and as far south as Kerguelen (Green and MacQuitty, 1987).

Halacarus ctenopus Gosse, 1855 sensu Lohmann, 1893

Survey record: 5

One specimen was taken from Laminaria digitata/Palmaria palmata low on the shore. Brady (1875) recorded this species from Westport, Co. Mayo, Birtebuy Bay and the Aran Islands, Co. Galway. Halbert (1915) repeated these records. Green and MacQuitty (1987) record the species from Clew Bay, Co. Mayo and Galway Bay. It is recorded from Britain, from both sides of the North Atlantic and from the Mediterranean (Green and MacQuitty, 1987).

Thalassarachna baltica (Lohmann) 1889.

Survey records: 2, 3, 4, 5, 9, 13, 17, 20, 21, 23, 27, 28, 29, 30, 31

This species is widespread and abundant in Ireland. It was generally found on fucoids and other algae in the lower intertidal zone but also occurred on other substrata such as sponges, among mussels and barnacles and in clumps of Lichina pygmaea. Bartsch (1985) identified this species from the Strangford Narrows. It occurs in Britain and is widely distributed on both sides of the North Atlantic (Bartsch, 1985; Pugh and King, 1985; Green and MacQuitty, 1987).

Thalassarachna basteri (Johnston) 1836

Survey records: 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 15, 17, 18, 21, 22, 23, 27, 28, 30, 31.

Widespread and abundant, T. basteri is the commonest halacarine on the Irish coast. It was found on a large range of substrata including fucoids and other algae, mussels, barnacles, hydroids, sponges and sediments beneath algae. It was found at all levels on the shore and in the shallow sublittoral. Halbert (1915) found this species on Clare Island and in Blacksod Bay, Co. Mayo, at Ardfry, Co. Galway and at Howth and Sandycove, Co. Dublin. Bartsch (1985) recorded it from the Strangford narrows and from the northern Irish Sea. It is widely distributed in Europe from the Arctic to the Mediterranean and Black Seas and on the Atlantic coast of North America (Bartsch, 1985; Green and MacQuitty, 1987).

Thalassarachna capuzina (Lohmann) 1893

Survey records: 19, 20

This species was found in coarse sediments below Ascophyllum nodosum. Halbert (1915) described a species, which he called Halacarus areolatus, from Blacksod Bay, Co. Mayo. The type specimen has not been traced and Bartsch (1985) tentatively synonymized H. areolatus with T. capuzina. Bartsch identified T. capuzina from the Strangford Narrows and from the northern Irish Sea. It is known from Britain, France, the North, Baltic and Black Seas and from eastern North America (Green and MacQuitty, 1987).

Thalassarachna procera (Viets) 1927.

Survey record: 11

Two specimens were taken from sand mixed with algal debris. Bartsch (1985) identified this species from the Strangford Narrows and the northern Irish Sea. Although it is not recorded from Great Britain it has a similar distribution to the closely related T. capuzina (Bartsch, 1985).

Subfamily SIMOGNATHINAE Viets.

Simognathus minutus (Hodge) 1863

Survey records: 24, 30

This species was found among Corallina and other algae on exposed shores. Halbert (1915) found it on Clare Island, Co. Mayo and at Portstewart, Co. Derry. Bartsch (1985) recorded it from the Strangford Narrows. It is known to occur in Britain, the North Sea and on the Atlantic coast of France (Green and MacQuitty, 1987).

Subfamily LOHMANNELLINAE Viets.

Lohmannella falcata (Hodge) 1863

Survey records: 8, 11, 16, 24, 27, 29, 30

L. falcata was found on a range of substrata including algae, mussels, barnacles and Lichina pygmaea, generally on the lower shore. Halbert (1915) recorded this species from Blacksod Bay, Co. Mayo and Bartsch (1985) identified it from the Strangford Narrows and the Northern Irish Sea. It is widely distributed in Britain and has a very large range including seas around Europe, North and South America and Africa (Bartsch, 1985; Green and MacQuitty, 1987).

Lohmannella kervillei (Trouessart) 1894

Survey records: 5, 6, 11

This species was found on Laminaria digitata and rhodophytes low on the shore and in the shallow sublittoral. It is not previously recorded from

Ireland but has been found in Britain (Pugh and King, 1985; Green and MacQuitty, 1987). Elsewhere it is recorded from the French coast and the Azores (Green and MacQuitty, 1987).

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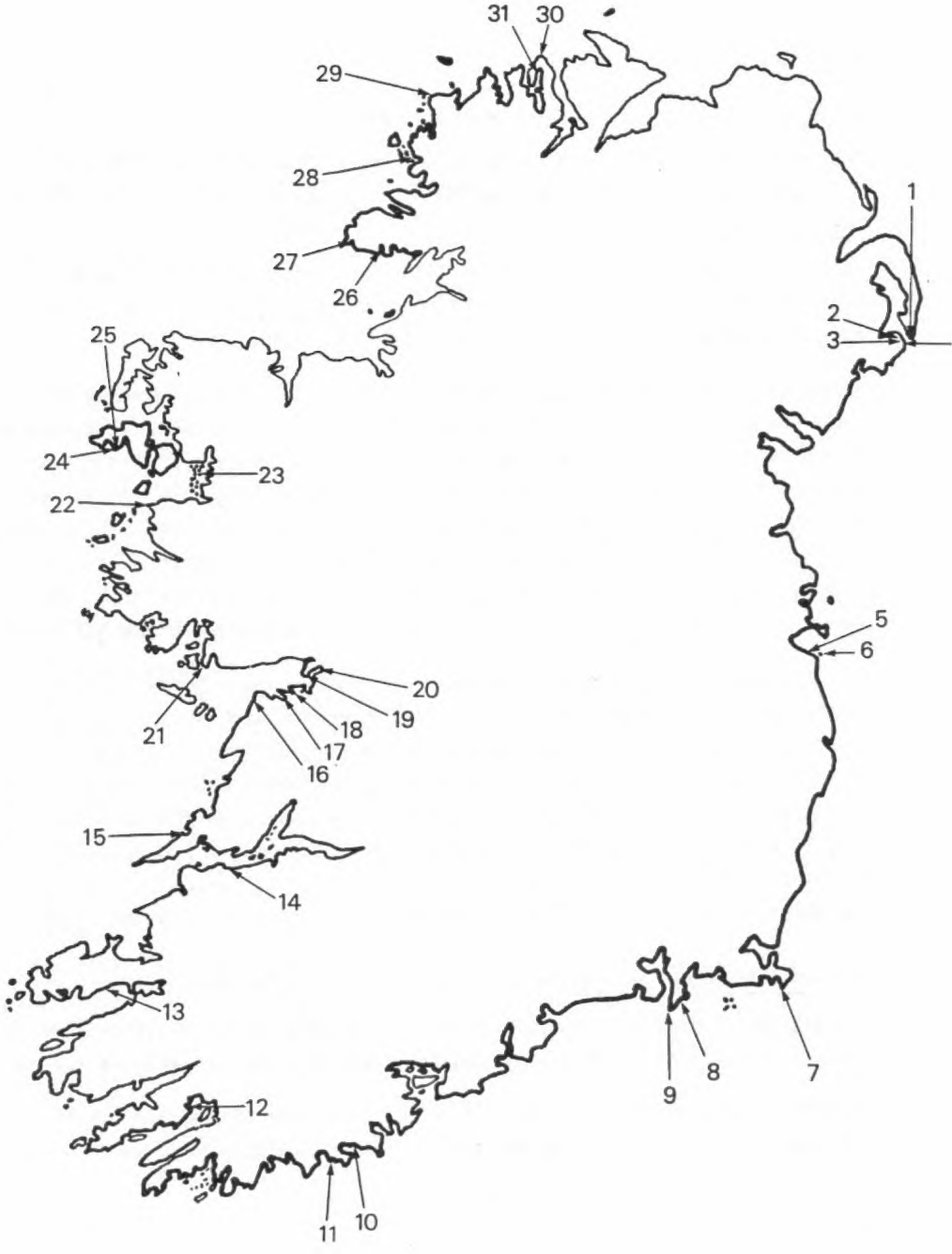
FIGURE 1: Map of the coastline of Ireland showing the locations of sites mentioned in this paper.



Bull. Ir. biogeog. Soc. No. 11 (1988)

ECTAETIA PLATYSCELIS, SETISQUAMALONCHAEA SETISQUAMA AND SUILLIA HUMILIS: INSECTS (DIPTERA) NEW TO IRELAND, PLUS SOME MISCELLANEOUS IRISH SUILLIA RECORDS.

Martin C. D. Speight

Ectaetia platyscelis (Loew) (Diptera: Scatopsidae)

Offaly: hatched 27 April 1987, Charleville Wds., N3112 (NV4), ex damp rot-hole debris from trunk-base hole in living Fraxinus, collected 24 March 1987, Quercus/Fraxinus woods by lake, coll. and det. MCDS.

Wicklow: hatched 26 May 1987, Laragh, T1396 (PU3), ex damp rot-hole debris from trunk-base rot-hole in moribund Ulmus procera, collected 21 April 1987, edge of mixed woods, coll. and det. MCDS, in NMI collections.

An account of the Scatopsidae known from Ireland was published recently by D'Arcy-Burt and Chandler (1987). Ectaetia, with three species in Great Britain, is one of the genera for which no Irish records were presented. Ectaetia is one of the most easily recognised of scatopsid genera and E. platyscelis may with facility be determined using the keys provided by Freeman and Lane (1985). In Great Britain this fly has been recorded from various counties in southern England, to as far North as Norfolk. I have no information on the range of E. platyscelis in Europe. This species is not known in the Nearctic.

The preference of Ectaetia species for tree rot-holes, as sites for larval development, is evident from the data given in Freeman and Lane (op. cit.) They cite E. playtscelis as having been reared from rot-holes in Fagus, Tilia and Ulmus. Having reared a range of Diptera from rot-hole debris collected in various conditions over the last few years I suggest that the fact E. platyscelis was, on both occasions, reared by myself from material collected from rot-holes at ground level, may be significant. The fly did not emerge from material collected from any of the holes above ground level.

Setisquamalonchaea setisquama (Czerny) (Diptera: Lonchaeidae)

Co. Wexford: 6 May 1977, male, Raven Pt., T1124 (PU4), on Salix repens flowers, swept, dune system/conifer plantation, coll. and det. MCDS, in NMI collections.

Recently (Chandler, 1986), an account of the Lonchaeidae known from Ireland has been published. As its author says, the data available about these flies

in Ireland are scant and the list of Irish species cannot be regarded as complete. The addition of a species to that list is thus more expected than surprising, though the occurrence in Ireland of S. setisquama might be rather unexpected, since this lonchaeid is not so far recorded in Great Britain.

Kovalev and Morge (1984) list but two European species in the genus Setisquamalonchaea. These two may be distinguished from each other using the keys in Morge (1963). Essentially, S. setisquama has long, black bristles mixed in with the white hairs edging the squamae, while S. fumosa (Egger) has only white hairs there. S. fumosa is recorded from various parts of Ireland by Chandler (op. cit.) and is widely distributed in Europe. It also occurs in the Nearctic. S. setisquama has a much more limited range, having till now been found only in various central European countries from East Germany, South to Jugoslavia. The biology of S. setisquama is unknown, but the larvae of S. fumosa develop in "a wide range of plant materials, usually partly decayed stems or roots of herbaceous plants" (Chandler, op. cit.) and the larvae of S. setisquama might be expected to have a similar habitat.

Suillia humilis (Meigen) (Diptera: Heleomyzidae)

Co. Wicklow: 11 October 1987, male, Glenmalure T0991 (PU3), on trunk of old beech in sun, deciduous woodland fragment beside road, valley bottom, coll. and det. MCDS.

No list has been published of the Heleomyzidae known to occur in Ireland (Ashe et al, in press). But a revision of the heleomyzid genus Suillia has just appeared (Withers, 1987)which deals with both British and Irish species, and includes a chart showing available distribution information. The definition of S. humilis used by Withers is based on a re-examination, by him, of the type material of this species and S. inornata (Loew), which has led him to synonymise the latter species with S. humilis. Withers did not record S. humilis from anywhere in Ireland, but shows that the species is widely distributed in Great Britain, with a number of Welsh and Scottish records. In continental Europe S. humilis is known from Poland to Austria and S. West to the Pyrenees. Suillia larvae develop in large basidiomycete fungi such as Agaricus and Boletus.

I have no previous experience of S. humilis and thus cannot say whether an October flight season is typical for the species. If the insect can only

easily be found at that time of the year though, the lack of Irish records is perhaps not surprising, since October weather is not very conducive to field work. The Glenmalure record derives from a specimen collected casually during course of a family outing, using a small bottle slipped into my pocket "just in case I saw something". Other Suillia species with which I am familiar are not insects on the wing only during some part of the year most comfortably spent beside a roaring fire.

Some records of Suillia species in Ireland

The distribution data published by Withers (op. cit.) is in symbolic form, a plus sign being used opposite each county name for each species that has been found there. So, for some Suillia species he records from Ireland, the only published Irish distribution data are plus signs in his distribution chart. In order to provide some more detailed data I have taken this opportunity to present here the Suillia records available to me. Whether S. parva (Loew) should be included on the Irish list, as in Withers (1987), is uncertain. The Co. Wicklow record he cites is based upon a female determined as S. parva by myself, prior to description of S. dawnae Withers. The specimen concerned, from Knocksink Wd., shows some features of S. parva and other of S. dawnae. This puzzle may have to await resolution until males are found, since males of these two species are more easily separated.

N.B. In the following records, specimens have been collected and determined by the author, except where indicated otherwise.

S. affinis (Meigen)
Wicklow: 1 September 1978, Knocksink Wd., O2117 (PU3), Quercus/Fraxinus woods, coll. and det. P. Withers.

S. atricornis (Meigen)
Offaly: 5 July 1984, Charleville Wds., N3122 (NV4), beaten, Corylus/Fraxinus within damp Quercus wood beside lake.

S. bicolor (Zetterstedt)
Cork: 15 July 1983, W0929 (MT4), Quercus woods,

Galway: 27 July 1978, L8349 (MV2), beaten, Quercus woods by lake: 4 July 1978, Garryland Wd., M4103 (NU1), Quercus/Fraxinus woods, coll. D. Dowling, det. MCDS.

Meath: 22 June 1978, N9965 (PV4), deciduous woods.

Offaly: 5 July 1984, Charleville Wds., N3122 (NV4), Quercus/Fraxinus woods by lake.

Westmeath: 19 June 1976, N0446 (NV4), beaten from Quercus, deciduous woods.

Wicklow: 22 August 1987, T1985 (PU3), Quercus woods by stream, coll. D. Dowling, det. MCDS; 3 August 1987, Knocksink Wd., O2117 (PU3), Quercus/Fraxinus woods beside stream.

S. dumicola Collin
Offaly: 5 July 1984, Charleville Wds., N3122 (NV4), beaten, Corylus/Fraxinus scrub in Quercus woods by lake.

S. imberbis Czerny
Donegal: 9 August 1978, Glenveagh, C0018 (NA3), Quercus wood by lake.

Wicklow: 16 July 1971, T1191, (PU3), swept, Luzula, mixed woods by stream.

S. laevifrons (Loew)
Donegal: 2 September 1977, Glenveagh, C0018 (NA3), deciduous woods by lake.

Wicklow: 24 August 1978, T1985 (PU3), mixed woods, coll. D. Dowling, det. MCDS; 24 February 1975, Knocksink Wd., O2117 (PU3), Quercus/Fraxinus woods by stream, flying in sun; 24 August 1980, T1299 (PU3), mixed woods/rough grazing on moorland, along stream, 750 ft. alt.

S. notata (Meigen)
Galway: 27 July 1978, L8349 (MV2), beaten from Quercus, deciduous woods.

S. pallida (Fallen)
Clare: 28 May 1978, R2892 (MU3), limestone pavement with patches of Corylus scrub.

Dublin: 10 September 1980, O1627 (PV4), malaise trap, garden.

Meath: 19 June 1977, N9757 (PV4), deciduous woodland strip along stream, edge of arable field.

Wicklow: 22 September 1982, Glen of the Downs, O2611 (PU3), beaten, Quercus/Fagus beside stream: 22 September 1978, Knocksink Wd., O2117 (PU3), Quercus/Fraxinus woods beside stream.

S. parva Loew??
Wicklow: 24 February 1975, Knocksink Wd., 02117 (PU3), Quercus/Fraxinus woods along stream, flying in sun.

S. variegata Loew
Cork: 25 July 1976, Glengarriff, V9157 (MT4), Quercus woods.

Dublin: 2 May 1976, 02738 (PV4), deciduous woods; 29 May 1976, 01627 (PV4), malaise trap, garden.

Galway: 26 July 1978, L8349 (MV2), Quercus woods by lake, coll. D. Dowling, det. MCDS.

Wicklow: 12 August 1976, Knocksink Wd., 02117 (PU3), Quercus/Fraxinus woods; 8 August 1979, 02610 (PU3), deciduous woods by stream, coll. D. Dowling, det. MCDS.

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STUDIES ON THE MURROUGH, CO. WICKLOW, IRELAND: 3. CARRION BEETLES (COLEOPTERA).

R. M. Blackith, R. E. Blackith and M. C. D. Speight

Introduction

There are few published Irish records of burying beetles of the genus Nicrophorus (Necrophorus auct., see Pope, 1977), although 4 species are known from Ireland and supposedly widely distributed here (Johnson and Halbert, 1902). Du Chatenet (1986) indicates the presence in Ireland of a fifth species, N. vestigator Herschel, but on what basis is unclear. The paucity of Irish Nicrophorus records may reflect a low population density, as experiments (by RMB and REB) in which 191 dead mice were laid out on Three-rock Mountain (0180130), Barnaslingan Wood (0218202), Bray Head (0282155) and Knocksink Wood (0210177), in Cos. Dublin and Wicklow, revealed only one specimen of one Nicrophorus species. These and subsequent experiments will be described more fully elsewhere, and are designed to study the fate of small mammal corpses in Ireland. However, 129 dead mice laid out on the Murrough, Co. Wicklow, produced 7 specimens of Nicrophorus and various other carrion-feeding beetles. The present brief text records the identity of the carabids and silphids collected from these corpses. McNally (1987) has provided a description of the general character of the Murrough.

Methods

The mice (a laboratory-bred strain of Mus musculus), each weighing about 25 gms., were laid out on the ground in sheltered places during warm, sunny weather. They were left for 4 days, at which point they were inspected. Beetles feeding on the carcases, or found on or close to them, were preserved in alcohol and determined (by MCDS). With the exception of Pterostichus nigritus, the carabids were identified using Lindroth (1974). The female of P. nigritus referred to was determined using the key in Marion (1987). P. rhaeticus has not yet been found in Ireland. The silphids were identified using Joy (1932), augmented by du Chatenet (1986).

Records (all from 1987)

CARABIDAE

Abax parallelepipedus (Piller and Mitterpacher, 1783)
30 August, female, feeding on carcase, field, E. side of Broad Lough (T310954)

Calathus fuscipes (Goeze, 1777)
29 August, female resting on carcase, same locality; 30 August, 2 males feeding on carcase, same locality.

Calathus melanocephalus (L., 1758)
30 August, 2 males feeding on carcase, same locality; 30 August, 5 males + female, feeding on carcase, same locality.

Harpalus rufipes (de Geer, 1774)
30 August, female, resting on carcase, track S. from Killoughter Station (T309986).

Pterostichus madidus (Fabricius, 1775)
30 August, female, feeding on carcase, field, E. side of Broad Lough (T310954).

Pterostichus melanarius (Illiger, 1798)
30 August, female, beside carcase, track S. from Killoughter Station (T309986); 2 September, female, feeding on carcase, grass by railway, 5 Mile Point (0309021); 2 September, female, feeding on carcase laid on top of log, 6 Mile Point (0313039).

Pterostichus niger (Schaller, 1783)
2 September, male, by carcase, streamside, marshy field, Killoughter (T302993).

Pterostichus nigritus (Paykull, 1790)
30 August, female, by carcase, track S. from Killoughter (T309986).

SILPHIDAE

Nicrophorus humator (Gleditsch, 1767)
30 August, male, by carcase, tract S. from 5 Mile Point (0309012).

Nicrophorus investigator Zetterstedt, 1824
29 August, male and female, by carcase, cleared area N. of trading estate Wicklow (T310954); 30 August, male and female, by carcase in gap in wall, E. side Broad Lough (T310954); 30 August, male and female by carcase, under Ulex, edge Phragmites bed, S. of 5 Mile Point (0304010).

Phosphuga atrata, L., 1758
29 August, 5 specimens, on carcase, track S. from Killoughter Station (T309986); 30 August, 1 specimen, on carcase, same locality; 2 September, 1 specimen, on carcase, by hedge, field, W. side Broad Lough (T301966).

Phosphuga atrata s. subrotundata (Leach, 1817)
2 September, 1 specimen, feeding on carcase, edge of regenerating woodland W. of 6 Mile Point (0304044).

Discussion

Nicrophorus investigator (ruspator of Johnson and Halbert, 1902) is a widely ranging species whose occurrence occasions no surprise. In this part of its European range N. humator is predominantly a coastal species. In this instance it was found within 10 m of the sea shore. All our records of Nicrophorus species are derived from locations on light soils on sand or fine gravel, while some of those of Phosphuga and the carabids are from sites with heavier and even water-logged soils. It will be noted that in each case that N. investigator occurred, a male and female of this species were found together. The normal breeding biology in species of this genus is for a male-female pair to "take possession" of the carcase of a small mammal and then bury it, exhibiting strong defensive reactions in the event of intrusion by other Nicrophorus. The eggs of Nicrophorus are laid in underground galleries dug by the beetles and leading to the buried corpse. The female feeds the larvae on hatching, for the duration of their first instar. The complex breeding behaviour of these corpse burying beetles is reviewed by Milne and Milne (1976).

Phosphuga atrata is generally taken to be a mollusc predator. Here both of its sub-species were found on mouse carcases, so perhaps this beetle is less concerned with killing gastropods and more concerned with carrion feeding than the literature suggests. Interestingly enough, in 80% of specimens she sampled, Tod (1973) was unable to find evidence of the

presence of molluscan food in serological studies of the crops of wild caught Phosphuga atrata, although she was able to demonstrate that the supposedly snail-feeding carabid, Cychrus caraboides (L.), had, indeed, been feeding on molluscs. Unfortunately, her study did not include testing for consumption of the flesh of mammals. Of P. atrata she remarks that "It seems unlikely that a species with so specialised a mode of feeding would have been feeding on other prey (than molluscs)". Our observations would imply that perhaps the liquid this beetle secretes onto its molluscan prey, to dissolve its food prior to ingestion, work just as well on the corpses of small mammals. Abundant as it is in Ireland, P. atrata would seem an ideal topic for further study here.

The carabids recorded are mostly widely distributed open ground species, Calathus fuscipes and C. melanocephalus being particularly frequent in coastal localities. Harpalus rufipes, which, perhaps significantly, was recorded as resting on a corpse but not feeding on it, is primarily a seed-eating beetle (see Luff, 1980). Abax and Pterostichus species are cited as scavengers, recognised as consuming both live and dead invertebrate prey and vegetable matter (usually seeds, but also the flesh of low-growing fruits such as strawberries). Calathus species have been found to consume liquid food and are assumed to be predators.

Putnam (1983) summarises recent opinion on carabids and carrion by saying that they, together with staphylinid and histerid beetles, visit carrion primarily to predate blowfly larvae. Although some authors (e.g. Thiele, 1977) record feeding carabids on "flesh" in captivity, we have found no literature references to carabids specifically as feeders on vertebrate carrion in the wild. This is perhaps surprising, since there has been considerable discussion of carnivory, phytophagy and omnivory in carabids, as manifest in the useful series of papers by Hengeveld (1980a-c). There is widespread recognition of the fact that carabids can act as scavengers. For example, Crowson (1981) remarks (p. 482) that "Pterostichus are liable to eat almost any kind of small animal, living or dead, which they may encounter". But nowhere does either Crowson or any other author indicate that their concept of a "small animal" in this context includes corpses of small mammals like mice and voles. On the contrary, it is implied that

the "small animals" involved are all invertebrates of one sort or another. Nabaglo (1973) carried out a study similar to ours, but involving corpses of the vole Clethrionomys glareolus (Schreber), put out on lightly podsolised, loessic forest soils in central Europe. He records carabids from his vole corpses, including species of Abax and Pterostichus, but his only reference to their presence is in his statement that "on the eighth day the first Diptera and Carabidae appeared, which penetrated the surface of the carcass" We would like to believe that his statement can be interpreted as indicating that the carabids he found were feeding on his vole corpses, thus corroborating our own findings, but recognise that other interpretations are available. We observed carabids standing on the mouse corpses, head down in open, post-mortem wounds, clearly engaging their mouthparts in the exposed flesh. We deduce that the Pterostichini we found were probably ingesting both liquid and tissue from the corpses.

We have not found even one reference to any attempt to investigate the use made of small mammal corpses by carabids under field conditions. With the exception of Tod (1973), all the accounts we have seen of carabid food preferences are based on analysis of gut contents that have not included biochemical analysis of the liquid fraction of the contents of the gut, and Tod's serological work did not involve testing for vertebrate food. It is possible that, in this way, carrion-feeding by carabids has remained largely unrecognised. The carrion-feeding activities of the carabid species noted on the Murrough cannot be easily dismissed as chance occurrences. On the contrary, these observations suggest carabids could play a significant role in the consumption of small mammal corpses in a wide range of environments and that such corpses could represent a significant food source for the beetles.

Footnote: A record of Nicrophorus investigator from Co. Dublin.
While the above text was in preparation I was sent a specimen of N. investigator by Mr. L. Mahon, who had found it within the grounds of Casement Aerodrome (00429), Baldonnell, Co. Dublin. I am grateful to Mr. Mahon for sending the specimen of this interesting species. M. C. D. Speight.

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SOME RECORDS OF IRISH ODONATA (INSECTA).

J. P. O'Connor and D. Murphy

The National Museum of Ireland has a large collection of Irish Odonata. Recently it was curated by one of us (D.M.) and rehoused in new entomological cabinets. During the course of this work, the identity of all the material was checked and where necessary, specimens were redetermined by the authors. In the last decade, the mapping of the distribution of the Irish Odonata has received considerable attention and several atlases containing Irish data have been published (Ni Lamhna, 1977, 1978; Heath, 1978; Chelmick, 1979). Hammond (1977) also contains distributional maps. The most recent maps are in Hammond (1983), but some records given by Ni Lamhna (1978) have been omitted. The Museum material provided numerous 10 km records not reported by the authors cited above and these are given below. Some are of particular biogeographical interest in that they greatly extend the known range of certain species. The nomenclature follows Hammond (1983) and as in that work, records of Sympetrum nigrescens Lucas and S. striolatum (Charpentier) have been combined. The following abbreviations are used in the text:- JNH - J. N. Halbert, WFJ - W. F. Johnson, JK - J. J. F. X. King, JOC - J. P. O'Connor and JMOC - J. P. and M. A. O'Connor. The records are arranged according to their relevant vice-counties. In some instances, the name of the collector and/or date of capture were unavailable.

Coenagrion puella (L.)

North Tipperary (10): River Shannon, Ballina R708727, 4.vii.1981, JMOC.
Offaly (18): Mongan Bog N035302, 5.vii.1983, J. Good, raised bog.
Waterford (6): Ballinlough, near Kill S4403, 19.vii.1987, JOC.
Wexford (12): New Ross S7-2-, 1.vi.1893.
West Mayo (27): Westport L9-8-, JK.

C. pulchellum (van der Linden)

Armagh (37): Poyntzpass J0-3-, 30.v.1919, WFJ., hill.
Clare (9): near Ennis R292796, 30.v.1984, JOC.
Kildare (19): Newbridge Fen N7715, 9.vi.1984, JOC; Maynooth N9-3-.

South Kerry (1): Carragh Lake, L. Beg V713903, 19.vi.1952, C. Longfield.
West Cork (3): Lough Allua W1966, 13.vi.1952, C. Longfield, bog.

Enallagma cyathigerum (Charpentier)

Armagh (37): Loughgall H9-5-, 18.vi.1892, WFJ.
Down (38): Dundrum J4-3-, 16.vi.1926, WFJ; Rostrevor J1-1-, 29.vi.1923, WFJ.
East Donegal (34): Coolmore G8-6-, WFJ.
Kildare (19): Milltown N763171, 4.vii.1982, Grand Canal feeder.
North East Galway (17): Lough Corrib M230410, 28.v.1980. B. Connolly, middle of lake.
South Kerry (1): Waterville V5-6-, 28.vii.1901.
West Mayo (27): Castlebar M1-9-, 17.vi.1909; Westport L9-8-, JK.
Westmeath (23): Mullingar N4-5-, JNH.

Pyrrhosoma nymphula (Sulzer)

Armagh (37): Poyntzpass J0-3-, in field; ditto, 4.vi.1920, canal.
Carlow (13): Cloughristick S7069, 19.vi.1982, JMOC, beside River Barrow.
Clare (9): Ballyeighter R346940, 29.v.1984, JMOC.
Down (38): Dundrum J4-3-, 4.vi.1926, WFJ, among herbage, roadside; Rostrevor J1-1-, 15.vii.1929, WFJ, mill; Warrenpoint J1-1-, 14.v.1928, WFJ, Clonmallon road.
Kildare (19): Newbridge Fen N7715, 9.vi.1984, JOC: Donadea N830328, 6.ix.1981, D. Murphy.
Louth (31): Castle Bellingham 00-9-.
North Tipperary (10): near Ballina R710725, 27.v.1984, JOC, small wood.
West Cork (3): Ardrigole V8-5-, 3.vi.1893; Castletown Berehaven, V6-4-, 3.vi.1893; Glandore W2-3-.
West Donegal (35): Ardara G7-9-, 13.vii.1892, WFJ.
West Mayo (27): Louisburgh L8-8-, vii.1910.
Westmeath (23): Mullingar N4-5-, JNH.
Wexford (12): New Ross S7-2-, 1.vi.1893; Ballyteige S9504, 26.v.1987, JOC.
Wicklow (20): Askintinny T245698, 12.vi.1926, A. W. Stelfox.

Ischnura elegans (van der Linden)

Armagh (37): Loughgall H9-5-, 13.vi.1892, WFJ: Poyntzpass J0-3-, 30.v.1919, WFJ, mill.
Down (38): Rostrevor J1-1-, 5.viii.1927, WFJ; ditto, 23.vii.1929.

Louth (31): Dundalk J0-0-, 14.vii.1927, WFJ.
South Kerry (1): Muckross V9-9-, vi.1905, JNH.
Waterford (6): Ballinlough, near Kill S4403, 19.vii.1987, JOC; Knockadeery Reservoir S4906, 19.vii.1987, JOC.
West Cork (3): Glandore W2-3-.
West Mayo (27): Louisburgh L8-8-, vii.1910; Westport L9-8-, JK.
Westmeath (23): Coosan Lake N050544, 2.vii.1980, JOC, swept.
Wexford (12): New Ross S7-2-, 1.vi.1893.

I. pumilio (Charpentier)

West Mayo (27): Clare Island L6-8-, vi.1909. A small section of this island lies in L7-8-.

Lestes dryas Kirby

Kildare (19): Grand Canal, Bonynge Bridge, Robertstown N8125, 13.ix.1983, C. Ronayne.

L. sponsa (Hansemann)

Cavan (30): Cuilcagh Lake N634894, 21.viii.1982, JOC.
Kildare (19): Ballynafagh Reservoir N809290, 9.viii.1981, D. Murphy.
Louth (31): Termonfeckin 01-7-, 27.viii.1924, WFJ.
Waterford (6): Ballinlough near Kill S4403, 19.vii.1987, JOC.
West Donegal (35): Portnoo G6-9-, WFJ.
West Galway (16): Furnace Island, Lettermullan L8323, 21.viii.1983. C. Ronayne, ponds and ditches beside road.
Wexford (12): Lady's Island Lake T104071, 28.viii.1980, JOC.

Calopteryx splendens (Harris)

Kildare (19): Straffan N9-2-.
Louth (31): Castle Bellingham 00-9-.
North Kerry (2): Flesk, Killarney V9-9-, vii.1938, EFB; Killarney V9-9-, vii.1938, EFB.
Offaly (18): Edenderry N6-3-.
West Mayo (27): Westport L9-8-, 15.vi.1909.

C. virgo (L.)

Waterford (6): Lismore X0-9-, 9.vii.1894.

West Cork (3): Castletown Berehaven V6-4-, 3.vi.1893; Hungry Hill V7-4-, 6.vi.1893.
West Galway: (16): Recess L8-4-, vii.1895.

Brachytron pratense (Muller)

Armagh (37): Acton J0-4-, vi.1900
Kildare (19): Bonynge Bridge N805256, 3.ix.1983, C. Ronayne, Grand Canal feeder, larva.
Louth (31): Castle Bellingham 00-9-.

Aeshna grandis (L.)

Armagh (37): Derrynoose H8-3-, 22.viii.1892, WFJ.
Carlow (13): Fenagh S7-6-, D. Pack Beresford.
Kildare (19): Stacumny, Celbridge N9732, 6.viii.1978, D. Attside.
Offaly (18): Charleville Lake, near Tullamore N315225, c.vii.1984, K. G. M. Bond.
South East Galway (15): Woodford R7-9-, JNH.

A. juncea (L.)

Antrim (39): Garron Point D2-2-, J. Scharff.
Armagh (37): Poyntzpass J0-3-, 28.vii.1910, WFJ; Armagh H8-4-.
Carlow (13): Fenagh S7-6-, D. Pack Beresford.
Cavan (30): Virginia N5988, c.1974.
Derry (40): Derry C4-1-, 3.viii.1892.
Down (38): Rostrevor J1-1-, 14.viii.1928, WFJ: ditto, 3.ix.1932, WFJ; Lough Brickland J1-4-, ix.1908, WFJ.
Dublin (21): off Rockabill Lighthouse 03-6-, vii.1967, caught by the Skerries trawler St. John; Tibradden 01-2-, JNH; Lakelands Park, Terenure 01-2-, 18.x.1929, R. N. Grey; Glendhu 01-2-, ix.1909; Pine Forest 01-2-, vii.1920.
Kildare (19): Clonoragh, Ballytore S7-9-.
North Kerry (2): Ardagh V9-8-, 20.viii.1929, EFB; Killarney V9-9-, vii.1923, EFB; ditto, 7.viii.1887, JK; Guitane Bog W0-8-, viii.1929, EFB.
South East Galway (15): Woodford R7-9-, JNH.
South Tipperary (7): Cahir S0-2-, Rev. Going.
West Mayo (27): Westport L9-8-, JK.
Westmeath (18): Athlone N0-4-, 26.vii.1888, JK.
Wicklow (20): Altidore 02-0-, ix.1891, G. H. Carpenter; Rocky Valley 02-1-, viii.1911.

Orthetrum cancellatum (L.)

Clare (9): Ballyeighter R346950, 29.v.1984, JMOC. Specimens flying along a path in a wood near the lakes.

O. coerulescens (Fabricius)

Kildare (19): Louisa Bridge N9936, 2.viii.1982, JMOC; ditto, 22.viii,1982, JMOC. Adults common beside pools near a small stream in a marshy area.
South Kerry (1): Loo Bridge, Kenmare, W0-8-, 2.vii.1901.
West Donegal (35): Portnoo G6-9-, 5.vi.1918, WFJ; ditto, 8.vi.1918 and 2.vii.1920, WFJ.

Libellula quadrimaculata L.

Armagh (37): Churchill H8-6-, 28.v.1887, WFJ.
Waterford (6): Glenshelane, near Cappoquin S1-0-, JNH/G. P. Farren.
West Cork (3): Adrigole V8-5-, 3.vi.1893.
West Mayo (27): Westport M0-8-, JK; Achill Island F7-0-, 14.vi.1909; Achill Sound, F7-0-, vi.1910, WFJ.
Westmeath (23): Mullingar N4-5-, JNH; Athlone N0-4-, 3.vii.1888, JK.

Sympetrum danae (Sulzer)

Limerick (8): Lisnagry Bog R7060, 28.viii.1981, M. Quirke.
Longford: (24): Castle Forbes N098798, 19.viii.1933, A. W. Stelfox.
North Kerry (2): Muckross, Killarney V9-9-, viii.1946, EFB.
Offaly (18): Mongan Bog N0330, 14.vii.1985, J. Good.
South East Galway: Portnumna M8-0-, 3.ix.1924, R. A. Phillips.
West Donegal (35): Portnoo G6-9-, 21.ix.1917, WFJ.
West Galway (16): Knock near Spiddal M1626, 28.viii.1981, J. M. Chalmers-Hunt.

S. sanguineum (Müller)

Mid Cork (4): Lough Gal W3-7-, 22.vii.1969, C. E. Longfield.
Sligo (28): Carrowmore Lough G6734, 11.viii.1983, D. C. F. Cotton.

S. nigrescens Lucas/S. striolatum (Charpentier)

Armagh (37): Poyntzpass J0-3-, 28.viii.1897, WFJ; ditto 26.ix.1902, WFJ, Churchill H8-6-, 16.viii.1889, WFJ; Armagh H8-4-, 9.viii.1889, WFJ; Acton J0-4-, 7.viii.1899; ditto, 27.viii.1898, WFJ.
East Donegal (34): Innistrahull C4865, 18.ix.1960, D. J. O'Sullivan.

Kildare (19): Kingsbog N712091, 7.viii.1983, D. Doogue, near Schoenus fen; Newbridge Fen N774163, 11.ix.1985, JOC.
Laois (14): The Derries N586050, 20.ix.1982, JOC, mixed wood.
Wicklow (20): Blessington Reservoir N974126, 23.viii.1981, JMOC.

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THE IRISH CERAMBYCID FAUNA (COLEOPTERA: CERAMBYCIDAE).

Martin C. D. Speight

Summary

A revised list of Irish Cerambycidae is presented. Three species are removed from the list and one, Nathrius brevipennis, is added. The cerambycid fauna of Ireland is compared with that of Great Britain and Northern France. It is suggested that the unexpectedly small number of species associated with oak and elm in Ireland is due primarily to eradication of much of the fauna by man's forest-clearing activities during the historic period. It is concluded that colonisation of Irish deciduous woodland by additional cerambycid species is extremely unlikely in the foreseeable future, even with appropriate woodland management. Cerambycid species that can be recognised as now threatened with extinction in Ireland are indicated.

Sommaire

Une révision de la liste des cerambycides d'Irelande est presentée. Trois espèces sont rejetées de la liste et la liste est également augmentée d'une espèce, Nathrius brevipennis. Les faunes des cerambycides d'Irelande, de Grande Bretagne et du Nord-Ouest de la France sont contrastées. Il est indiqué que l'explication la plus logique pour le nombre, exceptionnellement petit, d'espèces de cerambycides irlandais qui dependent des chênes et ormes, est que la plus grande partie de cette faune fut exterminée par consequence de l'abattage des forêts. En plus, il est suggeré qu'un ré-etablissement naturel des espèces perdues n'est plus possible, même si la gestion de la forêt les encourage. Les espèces de cerambycides qui sont aujourd'hui menacées en Irlande, sont detaillées.

Introduction

Johnson and Halbert (1902) list 21 cerambycids, or longhorn beetles, as occurring in Ireland. Five of those are only very doubtfully indigenous (see below), leaving a fauna of 16 species. Since then, only four probably indigenous species have been added to the list, to give a fauna of 20 species. Even if species are included which are, at these latitudes,

normally confined to house timbers and items like wickerwork baskets, on the assumption they may have now established themselves in Ireland, the total number of Irish species rises only to 23, including one added in the present account. In contrast, the indigenous cerambycid fauna of Great Britain stands at 57 species, while that of Northern France stands at 111 species.

During the present century, the vast majority of families of Irish Coleoptera have received markedly little attention. One of these neglected families is the Cerambycidae. Seeing the peculiarly small number of cerambycid species known from Ireland, it is perhaps not surprising they have occasioned little interest. The first part of the present text seeks to up-date the Irish species list. The second part considers why so few cerambycids are known from Ireland, based on discussion of the cerambycid fauna of Ireland/Great Britain/Northern France, as tabulated in Appendix 1. Appendix 2 provides some additional distribution records for Irish cerambycids.

Species list

In the following list, the nomenclature follows Villiers (1978). Seeing there are great differences between the nomenclature used in Villiers (op. cit.) and the frequently referred to works of Johnson and Halbert (1902), Hickin (1975) and Pope (1977), the names used in these other accounts are given indented below, where they differ from those used in Villiers (op. cit.). Genera and species are listed alphabetically, under the appropriate subfamily. Species which have been found alive in Ireland only in introduced timber are marked with an asterisk (*). The species marked in this way should not be regarded as indigenous to Ireland. For determination of Irish cerambycids, the most reliable text I have come across is Villiers (1978).

ASEMINAE

* Arhopalus tristis (Fabricius)
  Arhopalus fetus (Mulsant), misspelling for ferus (Mulsant) (Hickin, 1975)
  Asemum striatum (L.)

LEPTURINAE

  Alosterna tabacicolor (de Geer)
    Grammoptera tabacicolor (de Geer) (Johnson and Halbert, 1902)
  Anoplodera sexguttata (Fabricius)
    Leptura sexguttata Fabricius (Hickin, 1975; Pope, 1977)
  Grammoptera ruficornis (Fabricius)
  Grammoptera variegata (Germar)
  Leptura aurulenta Fabricius
    Strangalia aurulenta (Fabricius) (Johnson and Halbert, 1902; Hickin, 1975; Pope, 1977)
  Leptura maculata Poda
    Strangalia armata Herbst (Johnson and Halbert, 1902)
    Strangalia maculata (Poda) (Hickin, 1975; Pope, 1977)
  Leptura quadrifasciata L.
    Strangalia quadrifasciata (L.) Johnson and Halbert, 1902; Hickin, 1975; Pope, 1977).
  Pseudallosterna livida (Fabricius)
    Leptura livida Fabricius (Johnson and Halbert, 1902; Hickin, 1975; Pope, 1977)
  Rhagium bifasciatum Fabricius
 *Rhagium inquisitor (L.)
    Rhagium indigator Gyllenhal (Johnson and Halbert, 1902)
  Rhagium mordax (de Geer)
    Rhagium inquisitor Fabricius (Johnson and Halbert, 1902)
  Stenurella melanura (L.)
    Strangalia melanura (L.) (Johnson and Halbert, 1902; Hickin, 1975; Pope, 1977)

CERAMBYCINAE

Aromia moschata (L.)
Callidium violaceum (L.)
Clystus arietis (L.)
*Cordylomera spinicornis (Fabricius)
*Gracilia minuta (Fabricius)
*Hylotrupes bajulus (L.)
*Nathrius brevipennis (Mulsant)
Leptideella brevipennis (Mulsant) (Hickin, 1975)
*Xylotrechus colonus (Fabricius)

LAMIINAE

*Acanthocinus aedilis (L.)
Lamia textor (L.)
Leiopus nebulosus (L.)
*Monochamus confusor Kirby
*Monochamus scutellatus (Say)
*Monochamus sutor L.
Pogonocherus hispidulus (Piller and Mitterpacher)
Pogonocherus bidentatus Thomson (Johnson and Halbert, 1902)
Pogonocherus hispidus (L.)
Tetrops praeusta (L.)

Species to be removed from the Irish list

The notorious R. E. Dillon (see O'Connor, 1981), many of whose outlandish Irish Lepidoptera records have now been discredited, unfortunately also collected Coleoptera. He recorded three cerambycids from Ireland which have never been seen here since. Given the doubt attached to the provenance of so many of Dillon's more "interesting" captures these three cerambycids (listed overpage) should, in the present author's opinion, be relegated to the category of species whose presence in Ireland requires to be substantiated by further records, before they can be justifiably included in any list of Irish insects.

Dinoptera collaris (L.)
Pachyta collaris L. (Johnson and Halbert, 1902)
Acmaeops collaris (L.) (Hickin, 1975; Pope, 1977)
Brachyleptura fulva (de Geer)
Leptura fulva de Geer (Johnson and Halbert, 1902; Hickin, 1975; Pope, 1977)
Stictoleptura scutellata (Fabricius)
Leptura scutellata Fabricius((Johnson and Halbert, 1902; Hickin, 1975; Pope, 1977)

One further species demanding mention at this point is Rhagium inquisitor. The confused history of this beetle in Ireland has been discussed in Speight (in press, a). Essentially, it seems very unlikely that R. inquisitor exists in Ireland at present, but Johnson and Halbert (1902) talk about a species they call R. inquisitor as being not infrequent. The R. inquisitor of Johnson and Halbert is, as indicated above, the R. mordax of later authors. The genuine R. inquisitor may well have been present in Ireland earlier during the postglacial, before Pinus sylvestris disappeared, but the one or two 19th. and 20th. century records of the species seem most likely to have been of imported specimens.

The cerambycids of Ireland, Great Britain and Northern France

In Appendix 1, the cerambycid species indigenous to Ireland, Great Britain and Northern France are listed. No complex statistical analysis is required to demonstrate that there are significant differences between the species lists for these three areas, but it is more difficult to arrive at convincing explanations for the differences. The most glaringly obvious difference is in the numbers of species involved. Only 20 cerambycid species can be listed as indigenous to Ireland, but nearly 60 species are to be found in the equivalent list for Great Britain and upwards of 110 species in its counterpart for Northern France. Four hypotheses can be recognised, as providing the basis for an explanation of Ireland's miniscule cerambycid fauna:

1. The dispersal powers of cerambycid beetles are inadequate to enable them to negotiate an obstacle such as the Irish sea, so they have been unable to colonise Ireland during the post-glacial period.

2. Cerambycidae have been unable to establish themselves in Ireland during the post-glacial due to lack of appropriate habitats in the island.

3. The cerambycid fauna present in Ireland today is but a remnant of the fauna which established itself in the island during the post-glacial, subsequent climatic change being responsible for extermination of much of the fauna before the onset of the scientific period.

4. The cerambycid fauna present in Ireland today is but a remnant of the post-glacial fauna which established itself prior to the time man began to exert an influence on the character of the countryside, man's subsequent activities having caused the extinction of much of the fauna before the onset of the scientific period.

These hypotheses can be examined one by one.

Cerambycid beetles are recognised as being extremely efficient at dispersal: more efficient, indeed, than most other insect groups. This aspect of their biology is reviewed in Crowson (1981). Even remote oceanic islands quickly accumulate a cerambycid fauna when there is habitat available to support these insects. Ireland is by no means a remote oceanic island and has clearly been colonised by 14,000 - 15,000 species of invertebrate during the post-glacial, including some cerambycids. It is thus difficult to argue logically and convincingly that the cerambycid species which have reached Great Britain, in particular, do not have the powers of dispersal necessary to enable them to establish themselves in Ireland during the post-glacial.

The host plant list given in Appendix 1 shows that the vast majority of the cerambycids known from Great Britain or Northern France are associated with trees indigenous to Ireland. The most noticeable exceptions are species associated with beech (Fagus) or willows which grow to large size, like Salix alba. So, even if some of the British or French cerambycids could arguably have failed to establish themselves in Ireland due to the absence there of an appropriate plant host, this does not provide an explanation for most of the "absentee" species. Forests exert a buffering influence upon the environment, protecting their fauna and flora from the extremes of climatic variability experienced outside. This is particularly true for certain components of forest structure, such as the wood of trees, the bark on which helps to protect the wood within from extremes of temperature

and humidity fluctuation. Consequently, the inhabitants of dead wood tend to range widely within the range of their tree hosts. Nearly all cerambycids have larvae which inhabit the woody tissues of trees. The few exceptions among the species considered here can be detected from examination of the preferred host plant list incorporated into Appendix 1. Another feature of note in this context is that many cerambycids are among the first wave of invaders to colonise dead and dying wood and their larvae possess the enzymes necessary to feed from the wood without it having been partially pre-digested by the actions of some other organism. Their larvae are thus not dependent upon the presence of other members of the saproxylic community in order to survive in the wood of their host tree (conversely, many other old- forest insect species are dependent upon the presence of a well-differentiated fauna of primary saproxylics, and it is quite probable that because there are so few Cerambycidae in Ireland today a whole range of other saproxylic invertebrates are missing from the Irish fauna). So, if habitat requirements have exerted a limiting influence upon the abilities of cerambycid species to establish themselves in Ireland, it is unlikely that that this has been manifest through the needs of cerambycid larvae, except in the case of species whose host plants are not indigenous to the island. Is it possible that some need of adult cerambycid beetles has prevented the "absentee" species from establishing themselves in Ireland? Certainly, there is no obvious reason why the adults of the "absentee" species should be unable to function in Ireland given that the adults of 20 or so other cerambycid species clearly can function in the island. And, seeing that nearly all the cerambycids associated with deciduous trees in Great Britain are recorded from Sweden (see Palm, 1959) to the Mediterranean coast of the Pyrenees (see Dajoz, 1965), it is difficult to imagine environmental factors which would prevent the adults of these species, at least, from establishing populations in Ireland. Yet the largest group of "absentee" cerambycids comprises species associated with deciduous trees indigenous to Ireland.

Turning to the question of the conifer-inhabiting cerambycids listed in Appendix 1, it should be noted that the enzymes necessary to digest the wood of conifers are different from those needed to digest the wood of deciduous trees like Quercus. Few cerambycids have therefore larvae which can exploit the timber of both coniferous and deciduous trees and conifer

and deciduous forests consequently support different assemblages of cerambycid species. I have pointed out elsewhere (Speight, 1985a) that Ireland's conifer forest fauna appears to have been lost with the disappearance of native pine (P. sylvestris) forest and that the habitats of saproxylics like cerambycids are not developed in commercial conifer plantations of the type planted in Ireland subsequently. It is a moot point whether the activities of man are primarly responsible for the disappearance of indigenous pine forest from Ireland but, since P. sylvestris was the only conifer, apart from Taxus and Juniperus (which do not seem to represent appropriate alternative plant hosts for the cerambycids attached to Pinaceae or Larix), occurring naturally in Ireland during the post-glacial, habitats appropriate to conifer-associated cerambycids have been missing from the island since native pine forest disappeared. I have suggested (Speight, 1985b) that some conifer-associated saproxylics may have been able to survive in Ireland by using the wood of long-dead P. sylvestris exhumed from bogs by natural processes, or by man. But there are so few known Irish species potentially involved, the cerambycid Asemum striatum being one example, that it is perhaps more appropriate to look to some less general theory for explanation of their presence in Ireland.

There are cold climate cerambycids in the European fauna, particularly among the species associated with fir (Abies) and spruce (Picea), but such species do not occur in the lists for Ireland, Great Britain or Northern France. It would thus be difficult to claim that climatic amelioration had caused the disappearance from Ireland of any of the species listed in Appendix 1, had they ever been established in the island. As to the effects of climatic deterioration since the post-glacial climatic optimum, while it is possible that some of the cerambycids found today in Northern France are absent from the British Isles because they are at the edge of their climatic range, it is difficult to argue that climatic factors are likely to be responsible for the absence from Ireland of the species occurring in Great Britain, knowing these "absentee" species nearly all occur also in Scandinavia. Seeing the extent to which Great Britain has been stripped of its forests, it is not easy to interpret the present-day distribution of cerambycids within Great Britain in terms of which species might be expected to occur in Ireland. For instance, six of the deciduous forest cerambycids known from Great Britain, but unknown in Ireland, are

recognised as being today threatened with extinction in Britain (Shirt, 1987) and two others are already extinct there (see Girling, 1984; Harding and Plant, 1978). All that can be said is that, in Great Britain, six species of the non-Irish cerambycids associated with deciduous trees still occur as far North as Scotland (Kaufmann, 1948; Crowson, 1962).

The last hypothesis requiring consideration is whether the Irish cerambycid fauna is small today, in comparison with that of Great Britain and Northern France, because species have been exterminated in Ireland by man's forest clearance activities. This question seems to relate primarily to the species associated with oak and/or elm, so I have considered them in isolation from the rest of the fauna in the following paragraphs.

That extensive forests of deciduous trees existed in Ireland in the past (i.e. earlier in the post-glacial) is not really open to question. Similarly, there is no doubt that the loss of Ireland's deciduous forests was caused by human activity, which left the island the most deforested part of Western Europe. Further, evidence is now available to demonstrate that the areas of deciduous woodland remaining today are too small to support the sort of woodland avifauna which would otherwise be expected here (Wilson, 1977). And, to judge from data available for elsewhere in Europe, much of the saproxylic fauna of an area the size of Ireland could be expected to disappear before the extent of its forest cover had diminished to that now found in Great Britain, let alone that found in Ireland. But there has been virtually no investigation of the insect fauna of Irish post-glacial deposits of a type and date appropriate to reveal the remains of cerambycids now extinct in the island, however likely the existence of such remains may be. As a result, if cerambycids not found in Ireland today were present earlier in the postglacial this cannot yet be proven. However, there are certain features of the present-day Irish cerambycid fauna which suggest not only that there may well have been more species in Ireland in the past, but also that the missing species may have been exterminated by man's activities.

In Table 1 below, the tree-associated cerambycids known from Ireland, Great Britain and Northern France have been grouped according to whether their larval habitats occur almost exclusively in over-mature and dead trees or in both young and over-mature (and dead) trees. The species consigned to the first category are those whose larval habitat is given as

"o/d trees" in Appendix 1. The species consigned to the second category are the other tree-associated species in Appendix 1. Species with larvae which inhabit dead twigs, small dead branches and dead roots make up the second category, such features being of reasonably frequent occurrence on even young trees. The species have been further subdivided according to their preferred tree-hosts, which have been grouped in three categories. The species inhabiting Pinaceae and/or Larix have been grouped in one category as conifer-associated, the species inhabiting Quercus and/or Ulmus have been grouped in a second category, as associated with indigenous Irish trees which grow to large size and are long-lived. The third category comprises species associated with smaller, shorter-lived deciduous trees. Cerambycid species preferring Acer, Carpinus, Fagus, Salix alba, S. viminalis or Tilia have been excluded from consideration because their preferred tree-host is not indigenous to Ireland. Fraxinus does not figure in the table because, although it is a large, somewhat long-lived tree, there are virtually no cerambycids associated with it and none within this part of Europe which demonstrate a preference for it. It is not only cerambycids which "shun" ash - this tree has the smallest associated fauna of all frequently abundant and well distributed European tree species (see Southwood, 1961; Kennedy and Southwood, 1984).

TABLE 1. Numbers of tree-associated cerambycid species in various categories, grouped according to larval habitat.

The top row of figures gives the number of species in each category occurring in Ireland (IRL). The second row gives the same data for Great Britain (GB). The third row gives the same data for Northern France (NF). Only cerambycids associated with trees indigenous to Ireland are included in the table. (For further explanation, see text)

	Larval habitat in both young and over-mature/dead trees			Larval habitat in over-mature/dead trees only		
	Quercus /Ulmus	other decid.	conifers	Quercus /Ulmus	other decid.	conifers
IRL	3	4	0	6	4	2
GB	6	14	2	15	8	11
NF	12	19	4	35	12	19

While not wishing to base too much dependence upon the number of species in any particular category recognised in Table 1, there are nonetheless a number of points which can be made from examination of the numbers of species in each grouping and other points which can be made from consideration of all the species listed in Appendix 1:

1. Of the 112 tree-associated cerambycid species (see Appendix 1) reputedly indigenous to this part of Europe, fully 102 species are associated with trees indigenous to Ireland. Of the remainder, 9 are associated with trees not native to Ireland and the host associations of one are unknown.

2. The paucity of the conifer flora indigenous to this part of Europe is reflected in the fact that there is a far smaller number of conifer-associated cerambycids than deciduous tree-associated cerambycids in the list.

3. The fact that so few (approximately 20% of the tree-associated species) of the cerambycids of this part of Europe are associated with conifers shows how small a positive role conifer plantations can be expected to play in providing habitat appropriate to the cerambycids of the region. Indeed, it demonstrates how conversion of deciduous woodland to conifer plantation inevitably results in disappearance of most indigenous cerambycid species and a net decrease in the diversity of the cerambycid fauna.

4. The fact that so few of the cerambycids of this part of Europe depend upon habitats which are available on young trees shows how small a contribution plantations of commerical tree crops can be expected to play, in providing areas of new territory appropriate for colonisation by cerambycids indigenous to the region: harvesting of trees as soon as they reach maturity ensures that they do not develop habitats appropriate for use by the larvae of most saproxylics, including most cerambycids. It has been suggested that an 80% drop in overall faunal species diversity is associated with conversion of natural conifer forest to commercial conifer crop, in scandinavian forests (Heliövaara and Väisänen, 1984). This would mean that, of the conifer-associated cerambycids listed in Appendix 1, only four or five species might be expected to occur in conifer plantations in this part of Europe. That is more species than Table 1 suggests are associated with young conifers in the regional fauna, but the conifer plantation cerambycid fauna could not be expected to be entirely confined to such species,

since cut stumps left in the ground and cut branches left on the plantation floor do provide some additional habitats.

5. The fact that only a negligible proportion of the conifer-associated cerambycids found in this part of Europe is known from Ireland reflects the disappearance of natural conifer forest in the island and the absence of habitats appropriate for cerambycid larvae in the plantations of commerical conifer crops which now provide more than 90% of the tree cover of the island.

6. Only two cerambycid species not regarded as indigenous to this part of Europe are known to have established themselves there (in Northern France) by colonisation of plantations of commercial conifer crops.

7. The maximal diversity of habitats offered by over-mature and dead trees of the long-lived species of Quercus and Ulmus is reflected in the large number of cerambycids for which such trees are the preferred larval hosts.

8. The rudimentary Irish deciduous-forest cerambycid fauna reflects the small hectarage of deciduous woodland remaining in the island and suggests that the quantity of deciduous woodland now present in Ireland is inadequate to support a more representative selection of the cerambycid species occurring in the part of Europe covered by the species list in Appendix 1.

9. The differences between the ratios of young-tree cerambycids : overmature/dead-tree cerambycids occurring in Ireland, Great Britain and Northern France, as manifest for Quercus/Ulmus, suggests that for some considerable period of time Irish deciduous forests have been significantly lacking in large, overmature trees and dead trees.

10. In both Ireland and Great Britain the ratio of Quercus/Ulmus associated cerambycids : cerambycids associated with other deciduous trees is virtually 1:1, whereas in Northern France it is closer to 2:1, mostly due to the greater number of overmature/dead tree associated cerambycids found there in association with Quercus/Ulmus.

11. Whereas species whose larvae are associated with overmature and dead tree habitats predominate in the fauna of the large, long-lived Quercus and

Ulmus, cerambycids with larvae associated with young-tree habitats predominate in the fauna of other, shorter-lived deciduous trees.

12. Not one of the cerambycids associated with non-woody plants is known from Ireland and only two of them are known in Great Britain, although 8 are recorded from Northern France, where all but one of them are associated with plants indigenous to both Ireland and Great Britain.

When viewed in this way, it seems less surprising than inevitable that there are few conifer-associated cerambycids in Ireland, or that there are more deciduous-tree associated cerambycids than conifer-associated cerambycids, or that but a small fraction (c.20%) of the deciduous tree-associated cerambycids of this part (Ireland/Great Britain/Northern France) of Europe are found in Ireland.

Considering some of these points further, it is apparent that only one in four of the Quercus/Ulmus-associated cerambycids in this part of Europe can be expected to occur in woodland where trees are not allowed to live on after reaching maturity, to die naturally of old age. This is hardly surprising, since these trees reach maturity during the early part of their natural life span and gain progressively in bulk as they age. Oak is commercially harvested at an age of 100 - 120 years and can live naturally to an age of 800 years. Specimens of 400 - 500 years are frequent in natural forest. In Ireland, only one woodland, Charleville Wood in Co. Offaly, is noted for having oaks of more than 400 years in age. Elsewhere in Ireland, trees of more than 100 years of age are a rarity. Where have all the older trees gone? There is no indication that oak characteristically dies prematurely in Ireland, of natural causes. We know that during the last 500 years or more the larger trees have been remorselessly stripped from Irish woodlands and that during the famine period of the last century any available scrap of woodland was cut for firewood. Is it necessary to look further than this for explanation of the fact that in Ireland there are only twice as many cerambycids associated with overmature/dead Quercus and Ulmus as there are associated with young Quercus and Ulmus, while elsewhere in this part of Europe this ratio can be up to 3:1, as in Great Britain and Northern France?

Quercus and Ulmus are the only large, long-lived trees indigenous to Ireland which have an appreciable cerambycid fauna. It is not easy to see how the

cerambycids associated with overmature Quercus/Ulmus could have had greater difficulty in reaching Ireland than had the species associated with younger Quercus/Ulmus. Similarly, it is difficult to perceive a mechanism whereby climatic or other factors would have made establishment of colonies more difficult for the cerambycids associated with over-mature/dead trees, than for the species associated with younger trees. Conversely, it is all-too-easy to argue that, had these over-mature/dead tree cerambycids been present in Ireland in the past, man's activities, particularly in respect of preferentially removing the larger and older trees from forests and woodlands, would have caused the extermination of these over-mature/dead tree beetles at some time in the past and probably before attempts to record the insect fauna began. My conclusion is thus that, particularly in respect of species associated with oak and/or elm, the present-day Irish cerambycid fauna is minute because the vast majority of species have been eradicated by forest clearance and exploitation of the remaining woodland, not because the missing species never reached Ireland during the post-glacial and not because species which reached Ireland failed to establish themselves here. The same seems to be true, to a lesser extent, for the British fauna and I would estimate that in both Ireland and Great Britain the greater part (i.e. more than 50%) of the natural cerambycid fauna has been eradicated during the historic period by man's clearance and exploitation of forest. The phenomenon of absentee species is not, of course, restricted to the one beetle family Cerambycidae and the oak forest fauna, in particular, shows this same feature in Ireland in all manner of different insect groups, due, in my opinion, to exactly the same reason - faunal eradication caused by man's activities.

The implications of the above case relate not only to what has happened in the past but to what can be anticipated to occur in the future. The old-forest fauna of Europe is currently very much on the retreat (see Speight, in press, b) and species lost from one part of Western Europe are now unlikely to be replaced by natural immigration from elsewhere, even if introduction of conservation oriented woodland management regimes results in production of appropriate habitat: remaining enclaves of woodland carrying these "disappearing species" are too few and far between to represent population sources adequate for recolonisation of lost territory. Any

increase in the faunal diversity of Ireland's woodlands would have to be achieved by deliberate introduction. I have considered elsewhere the possibility of re-introducing species such as cerambycids (Speight, in press, b).

So far, this examination of the relative numbers of cerambycids in Ireland, Great Britain and Northern France has been virtually confined to consideration of the conifer and Quercus/Ulmus faunas. Peculiarities of the fauna associated with other deciduous trees, or with non-woody plants, remain to receive some attention. Seeing that a number of the deciduous trees involved and, in particular, various species of Populus and Salix, are not indigenous to Ireland, it is perhaps surprising that the Irish cerambycid fauna contains even as many species as it does, in the category associated with deciduous trees other than Quercus and Ulmus. However, smaller trees tend to be less used by man and, while their growth would not be encouraged, neither would they preferentially receive attention from the woodman's axe unless growing specifically where they were unwelcome. I would thus postulate that scrub woodland of trees like Betula, Corylus, Ilex, Prunus and Salix would tend to be more continuously present and more widely distributed in the Irish landscape than woodland of Quercus/Ulmus, throughout the historic period. Certainly, today scrub woodland occupies a far greater hectarage than mature Quercus or Ulmus woodland! This situation would allow the persistence of cerambycids associated with these smaller trees when those associated with old Quercus and Ulmus were disappearing due to eradication of habitat. As to why the contingent of species associated with these smaller trees is not, in that case, larger in Ireland, I would suggest the small number of such trees indigenous to Ireland plays a role, especially in respect of cerambycids associated with Populus and Salix. Further, scrub woodland does not provide the buffered environment characteristic of high forest and cerambycids associated with small trees such as Corylus show a significantly Southern distribution in Europe, so their absence from Ireland could be due to operation of climatic factors, as I have suggested for scrub-inhabiting asilids (Speight, 1987) also absent from Ireland. It is tempting to use climatic arguements to explain the absence from Ireland of all cerambycids associated with non-woody plants, especially since the two cerambycids in this category occurring in Great Britain are today both confined to Southern England. However, no analysis has yet been carried out of the Irish fauna of non-woody plants and I feel that there is need to consider more closely

the situation in other insect groups before attempting to interpret the data for these two cerambycids.

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APPENDIX 1: Cerambycidae of Ireland, Great Britain and Northern France and their larval habitats.

Symbols used: + = present; (+) = believed extinct; - = absent; (-) = believed to have been introduced by man, but now possibly established; ? = larval habitat unknown.

Abbreviations: GB = Great Britain; IRL = Ireland; NF = Northern France; o/d = overmature and dead; d = dead.

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Acanthocinus					
aedilis	Pinaceae	o/d trees	-	+	+
griseus	Pinaceae	o/d trees	-	-	(-)
Acanthoderes					
clavipes	Quercus	o/d trees	-	-	+
Aegosoma					
scabricorne	Fagus	o/d trees	-	-	+
Agapanthia					
cardui	thistles		-	-	+
villosoviridescens	thistles		-	+	+
violacea	Centranthus etc.		-	-	+
Alosterna					
tabacicolor	Ulmus	o/d trees	+	+	+
Anaerea					
carcharias	Populus	trunk wood	-	+	+
similis	Salix alba etc.	trunk wood	-	-	+
Anaesthetis					
testacea	Alnus/Betula	d branches	-	-	+

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APPENDIX 1 (Contd.)

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Anaglyptus					
mysticus	Alnus/Acer	d branches	-	+	+
Anastrangalia					
dubia	Pinaceae	o/d trees	-	-	+
sanguinolenta	Pinaceae	o/d trees	-	+	+
Anoplodera					
rufipes	Quercus	o/d trees	-	-	+
sexguttata	Quercus	o/d trees	+	+	+
Aphelocnemia					
nebulosa	Alnus/Betula	d branches	-	+	+
Arhopalus					
rusticus	Pinaceae	o/d trees	-	+	+
tristis	Pinaceae	o/d trees	-	+	+
Aromia					
moschata	Salix/Alnus	trunk wood	+	+	+
Asemum					
striatum	Pinaceae	o/d trees	+	+	+
Brachyleptura					
fulva	?	?	-	+	+
Callidium					
violaceum	Betula/Alnus	o/d trees	+	+	+
Carilia					
virginea	Pinaceae	o/d trees	-	-	+

APPENDIX 1 (Contd.)

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Cerambyx					
cerdo	Quercus	o/d trees	-	(+)	+
scopoli	Quercus	o/d trees	-	+	+
Chlorophorus					
figuratus	Betula	o/d trees	-	-	+
herbsti	Quercus	o/d trees	-	-	+
pilosus	Quercus	o/d trees	-	-	+
sartor	Quercus	o/d trees	-	-	+
varius	Acer	o/d trees	-	-	+
Clytus					
arietis	Quercus	o/d trees	+	+	+
tropicus	Quercus	o/d trees	-	-	+
Compsidia					
populnea	Populus	d branches	-	+	+
Cortodera					
humeralis	Quercus	o/d trees	-	-	+
Corymbia					
fontenayi	Quercus	o/d trees	-	-	+
rubra	Pinaceae	o/d trees	-	+	+
Dinoptera					
collaris	Quercus	o/d trees	-	+	+
Exocentrus					
adspersus	Quercus	d branches	-	-	+
lusitanus	Tilia	d branches	-	-	+
punctipennis	Ulmus	d branches	-	-	+

APPENDIX 1 (Contd.)

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Glaphyra					
umbellatarum	Malus	d branches	-	+	+
Gracilia					
minuta	Quercus	d twigs	(-)	+	+
Grammoptera					
ruficornis	Hedera		+	+	+
ustulata	Quercus	d twigs	-	+	+
variegata	Quercus	d twigs	+	+	+
Hesperophanes					
pallidus	Quercus	o/d trees	-	-	+
Hylotrupes					
bajulus	Pinaceae	o/d trees	(-)	(-)	+
Judiola					
sexmaculata	Pinaceae	o/d trees	-	+	+
Lamia					
textor	Betula/P.tremula	trunk wood	+	+	+
Leiopus					
nebulosus	Quercus	d branches	+	+	+
Leptura					
arcuata	Alnus	o/d trees	-	-	+
aurulenta	Ulmus	o/d trees	+	+	+
aethiops	Quercus	o/d trees	-	-	+
maculata	Alnus/Betula	o/d trees	+	+	+
quadrifasciata	Alnus/Betula	o/d trees	+	+	+

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APPENDIX 1 (Contd.)

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Mesosa					
curculionoides	Quercus	o/d trees	-	-	+
Molorchos					
minor	Pinaceae	bark	-	+	+
Monochamus					
galloprovincialis	Pinaceae	o/d trees	-	-	(-)
Morimus					
asper	Fagus	o/d trees	-	-	+
Nathrius					
brevipennis	Salix	d twigs	(-)	(-)	+
Necydalis					
major	Alnus	o/d trees	-	-	+
ulmi	Ulmus	o/d trees	-	-	+
Obera					
linearis	Corylus	d twigs	-	-	+
oculata	S. viminalis	d twigs	-	+	+
pupillata	Lonicera		-	-	+
Obrium					
brunneum	Pinaceae	o/d trees	-	+	+
cantharinum	P. tremula	o/d trees	-	+	+
Opsilia					
coerulescens	Echium		-	-	+
Oxymirus					
cursor	Pinaceae	o/d trees	-	-	+

APPENDIX 1 (Contd.)

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Pachyta					
quadrimaculata	Pinaceae	o/d trees	-	-	+
Pachytodes					
cerambyciformis	Betula	d roots	-	+	+
Pedostrangalia					
revestita	Quercus/Ulmus	o/d trees	-	+	+
Phymatodellus					
rufipes	Prunus	d branches	-	-	+
Phymatoderus					
glabratus	Juniperus	trunk wood	-	-	+
lividus	Quercus/Ulmus	o/d trees	-	-	+
pusillus	Quercus	o/d trees	-	-	+
Phymatodes					
testaceus	Quercus/Fagus	o/d trees	-	+	+
Phytoecia					
cylindrica	Umbelliferae		-	+	+
icterica	Umbelliferae		-	-	+
nigricornis	Compositae		-	-	+
Plagionotus					
arcuatus	Quercus	o/d trees	-	(-)	+
detritus	Quercus	o/d trees	-	-	+
Poecilum					
alni	Quercus	d branches	-	+	+

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APPENDIX 1 (Contd.)

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Pogonocherus					
fasciculatus	Pinaceae	d twigs	-	+	+
hispidulus	Betula/Alnus	o/d trees	+	+	+
hispidus	Malus	d branches	+	+	+
ovatus	Quercus	d branches	-	-	+
Prionus					
coriarus	Quercus	o/d trees	-	+	+
Pseudallosterna					
livida	Quercus	o/d trees	+	+	+
Pseudosphegestes					
cinereus	Quercus	o/d trees	-	-	+
Purpuricenus					
kaehleri	Quercus	o/d trees	-	-	+
Pyrrhidium					
sanguineum	Quercus	o/d trees	-	+	+
Rhagium					
bifasciatum	Quercus	o/d trees	+	+	+
inquisitor	Pinaceae	o/d trees	(-)	+	+
mordax	Pinaceae	o/d trees	+	+	+
sychophanta	Quercus	o/d trees	-	-	+
Rhamnusium					
bicolor	Fagus	o/d trees	-	-	+

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APPENDIX 1 (Contd.)

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Ropalopus					
clavipes	Alnus/Salix	trunk wood	-	-	+
femoratus	Quercus	o/d trees	-	-	+
spinicornis	Quercus	d branches	-	-	+
Rosalia					
alpina	Fagus/Salix alba	o/d trees	-	-	+
Rusticoclytus					
rusticus	Populus	o/d trees	-	-	+
Saperda					
octopunctata	P. tremula	o/d trees	-	-	+
perforata	P. tremula	o/d trees	-	-	+
scalaris	Prunus	o/d trees	-	+	+
Semanotus					
laurasi	Juniperus	d branches	-	-	+
Spondylis					
buprestoides	Pinaceae	o/d trees	-	-	+
Stenocorus					
meridianus	Prunus	d roots	-	+	+
Stenopterus					
rufus	Quercus	o/d trees	-	-	+
Stenostola					
ferrea	Salix/Alnus	d branches	-	+	+

APPENDIX 1 (Contd.)

SPECIES	PLANT HOST PREFERRED	LARVAL HABITAT	DISTRIBUTION IRL	GB	NF
Stenurella					
bifasciata	Quercus	d branches	-	-	+
melanura	Quercus	d branches	+	+	+
nigra	Betula	d branches	-	+	+
Stictoleptura					
scutellata	Fagus	o/d trees	-	+	+
Strangalia					
attenuata	Alnus/Betula	o/d trees	-	(+)	-
Tetropium					
castaneum	Pinaceae	o/d trees	-	+	+
fuscum	Pinaceae	o/d trees	-	-	+
gabrieli	Pinaceae	o/d trees	-	+	+
Tetrops					
praeusta	Prunus	d branches	+	+	+
Vadonia					
unipunctata	Prunus	trunk wood	-	-	+
Xylotrechus					
arvicola	Ulmus	o/d trees	-	-	+

APPENDIX 2: Miscellaneous notes on and distribution records of Cerambycidae known from Ireland.

In the following notes, the species and genera are dealt with in alphabetical order. The identity of specimens has been checked by the author except where otherwise indicated.

Alosterna tabacicolor

There are surprisingly few recent records of this little cerambycid, which might be expected to turn up with Grammoptera ruficornis, on umbel flowers. Available records as follows:
Kerry: August 1912 etc., Killarney, coll. E. F. Bullock, in NMI.
Wicklow: 11 July 1979, 02610, Glen of the Downs, Quercus woods, coll. D. Dowling; 14 June 1975, 02215, on umbel flowers, deciduous woods, coll. MCDS.

Anoplodera sexguttata

This species is rarely seen anywhere in Western Europe. There is only one Irish record, from north Kerry, reported in Kaufmann (1948). I have not seen the specimen on which this record is based. In Great Britain (see Shirt, 1987) and Sweden (see Andersson et al, 1987) A. sexguttata is among the insects regarded as "vulnerable" and in Ireland this species has to be regarded as endangered, if not extinct.

Arhopalus tristis

Although widely distributed on the continent and not infrequent in some parts of Great Britain, A. tristis is only recorded in Ireland as an imported species (see, for example, O'Connor and Nash, 1983).

Aromia moschata

Now very localised within much of its European range, A. moschata has been recorded repeatedly from one small part of Co. Kerry. It has also been reported as an import (O'Connor and Nash, 1979). In Ireland, A. moschata would fall into the vulnerable category. Previously unpublished records available to me are as follows:
Kerry: August, 1909, 1914, 1917, Killarney, coll. E. F. Bullock, in NMI; August 1930, Cahirnane, Killarney, coll. E. F. Bullock in NMI; 19 Sept.

APPENDIX 2 (Contd.)

1986, V9685, Killarney, on flowers of Polygonum, roadside, edge of Quercus woodland along lake shore, coll. MCDS.

Asemum striatum

So far, the only record of this beetle from Ireland is that from Co. Laois, reported by Speight (1976). It's association with conifers makes the status of the species uncertain in Ireland, since it might conceivably be able to colonise cut stumps in commercial conifer crops, even though there is so far no data to indicate this has happened here.

Callidium violaceum

Mentioned for Kerry, in Kaufmann (1948), based on a record from Lickeen. This species is listed as "vulnerable" in Great Britain (Shirt, 1987). It should be regarded as endangered in Ireland. There is a further unpublished Kerry record, as follows:
Kerry: June 1915, Killarney, coll. E. F. Bullock, in NMI.

Clytus arietis

If this distinctive species is really indigenous to Ireland, the infrequency with which it has been seen is puzzling, since it is polyphagous and not entirely confined to woodland, occurring also in old hedges etc. However, at present it is known from only Antrim and south Kerry and there is a record of it being imported, also (O'Connor and Nash, 1981). Assuming the species to be indigenous it should be regarded as vulnerable here.

Gracilia minuta

Reported from Wexford, as an import to Ireland, in Kaufmann (1948). If this species were to establish itself in Ireland, the South East would be the most likely part of the island in which to find it. There is an additional record as follows:
Wexford: July 1933, coll. E. O'Mahony, in NMI.

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Grammoptera ruficornis

One of Ireland's most widely distributed and most frequently met with longhorn beetles. May often be found in some numbers on the flowers of umbellifers or Crataegus etc. Available records as follows:
Cavan: 7 June 1941, Farrinseer, coll. R. C. Faris, in NMI.

Dublin: 18 July 1978, O2423, scrub beside stream, coll. D. Dowling, det. MCDS; 23 June 1985, O1627, suburban garden, coll. MCDS.

Galway: 6 August 1976, M4103, Garryland Wd., on Oenanthe flowers, deciduous woods beside turlough, coll. MCDS; 3 July 1983, M7631, Nr. Aughrim, mixed woods beside road, on umbel flowers, coll. MCDS.

Kerry: July 1913, Killarney, coll. E. F. Bullock, in NMI.

Kilkenny: 14 June 1982, S5230, on umbel flowers, roadside, edge of deciduous woods, coll. MCDS.

Laois: 7 June 1976, S3380, Grantstown Lake Wd., on Crataegus flowers, fen woodland, coll. MCDS; 16 July 1979, S4282, Quercus woods, coll. D. Dowling; 27 July 1979, N5203, Emo, mixed woods, coll. D. Dowling.

Leitrim: 29 May 1985, N1091, Clooncoe Wd., Salix/Alnus woods beside lake, coll. MCDS.

Mayo: 2 July 1941, Ashford Castle, coll. R. C. Faris, in NMI.

Meath: 19 June 1977, N9757, beaten, woodland strip beside stream, coll. MCDS; 23 June 1978, N9965, deciduous woods, coll. MCDS.

Offaly: 5 July 1984, N3122, Charleville Wd., Quercus woods, coll. MCDS.

Westmeath: 19 June 1976, N0446, beaten Quercus woods, coll. MCDS.

Wicklow: 27 June 1976, O2215, umbel flowers, deciduous woods, coll. MCDS; 20 June 1980, O2611, on Heracleum flowers, Quercus woods along stream, coll. MCDS; 27 June 1984, T1890, Clara N.R., Quercus woods, coll. MCDS.

Grammoptera variegata

Recorded from Co. Down by Kaufmann (1948). I have not seen the specimen. This species is not uncommon elsewhere in much of Europe, but should be regarded as vulnerable in Ireland, if not as endangered.

APPENDIX 2 (Contd.)

Hylotrupes bajulus

The house longhorn, imported in furniture and sometimes established in the rafters of old buildings. Reported from Co. Wicklow by Kaufmann (1948). This specimen is in NMI.

Lamia textor

There is only one Irish record of this magnificent beetle, reported in Kaufmann (1948), who records it from north Kerry. I have not seen the specimen. Assuming it is indigenous to the island L. textor must be regarded as endangered here. In Great Britain (Shirt, 1987) it is listed as vulnerable.

Leiopus nebulosus

Apparently widely distributed in Ireland, even if only seldom recorded. Available records as follows:

Dublin: 16 June 1987, beaten from large Quercus, suburban garden, coll. MCDS; 18 April 1945, Phoenix Pk., coll. E. O'Mahony in NMI.

Kerry: 16 August 1978, V9088, Quercus woods, coll. M. de Courcy Williams, det. MCDS; June 1938, Killarney, coll. E. F. Bullock, in NMI; April 1938, Cahirnane, Killarney, coll. E. F. Bullock, in NMI.

Offaly: 4 July 1984, N2429, Betula/Salix scrub on Clara Bog, coll. MCDS; 5 July 1984, N3122, Charleville Wd., Quercus woods, Coll. MCDS.

Westmeath: 19 June 1976, N0446, Quercus woods on an island in L. Ree, coll. MCDS.

Wicklow: 19 September 1979, O1602, swept, Vaccinium beneath Quercus, coll. MCDS; 2 August 1978, O2117, Knocksink Wd., Quercus woods, coll. M. de Courcy Williams, det. MCDS; 3 June 1927, Powerscourt, coll. E. O'Mahony, in NMI; 16 June 1939, Glenmore, coll. E. O'Mahony, in NMI.

APPENDIX 2 (Contd.)

Leptura aurulenta

This beautiful insect has been recorded on a number of occasions from part of south west Ireland and from Co. Wicklow. It is local in Great Britain but not listed in any of the categories of threatened insect (Shirt, 1987). It is, however, regarded as under threat in Austria (Holzschuch, 1983). In Ireland, it must be regarded as vulnerable. Additional records as follows:

Cork: 22 July 1976, V9157, Glengarriff, on Oenanthe flowers, clearing in mixed woods, coll. MCDS.

Kerry: 22 July 1976, V8362, on Rubus flowers, clearing, Quercus woods, coll. MCDS; 5 July 1976, V9973, Ardtully, coll. M. de Courcy Williams; July 1945, Kenmare, coll. E. F. Bullock, in NMI.

Wicklow: 23 June 1975, T1985, mixed woods, coll. MCDS.

Leptura maculata

There are fewer Irish records of this ubiquitous European species than might be expected.

Cavan: 16 April 1940, Gartanoul, coll. R. C. Faris, in NMI.

Cork: 6 May 1975, V9157, Glengarriff, mixed woods, coll. MCDS; 13 July 1983, W0930, Quercus woods, coll. MCDS; 19 August 1987, W3072, roadside scrub, coll. MCDS.

Galway: 30 July 1975, L8349, Derry-Clare Wd., on Filipendula flowers, Quercus wood, coll. MCDS.

Kerry: 20 June 1975, V9088, Quercus woods, coll. MCDS; 27 July 1976, V8362, on Rubus flowers, deciduous woods, coll. MCDS.

Offaly: 5 July 1984, N3122, Charleville Wd., Quercus/Fraxinus woods, coll. MCDS.

Roscommon: 20 June 1976 NO055, on Viburnum flowers, edge of deciduous woods, lake shore, coll. MCDS.

Wicklow: 27 June 1976, O2215, on Heracleum flowers, deciduous woods, coll. MCDS; 24 August 1978, T1985, mixed woods, coll. MCDS; 27 July 1981, O2513, Alnus/Salix swamp, coll. MCDS.

APPENDIX 2 (Contd.)

Leptura quadrifasciata

There are remarkably few records of this striking beetle from Ireland. Kaufmann (1948) mentions West Cork and Wicklow only. It should be regarded as vulnerable here.

Donegal: 11 August 1978, C0834, Ards, deciduous woodland, coll. M. de Courcy Williams.

Galway: 15 February 1975, M8303, Portumna, elytron in rotten Betula, mixed woods beside lake, coll. MCDS.

Nathrius brevipennis

This species has not previously been recorded from Ireland. It is an extremely small insect which in Great Britain has generally been regarded as an introduction (Hickin, 1975), though it is evidently well established there from Southern England to as far North as Yorkshire. Wickerwork furniture and baskets used to be much damaged by the larvae of this beetle, but I have not come across any reports of this type of damage occurring in Ireland. There is no way of knowing whether N. brevipennis is indigenous to Ireland, or a recently established species here, or a species occasionally imported alive with wicker goods. The Bullock specimen referred to below carries no label indicating whether it was collected in the field or in some building.

Kerry: July 1907, Killarney, coll. E. F. Bullock, in NMI.

Pogonocherus hispidulus

Kaufmann (1948) gives Armagh and Wicklow, for P. hispidulus. I would hesitate to suggest the status in Ireland of this reclusive species.

Kerry: June 1957, Flesk, Killarney, coll. E. F. Bullock, in NMI.

Wicklow: 20 June 1937, September 1938, Powerscourt, coll. E. O'Mahony, in NMI.

Pogonocherus hispidus

The widely scattered Irish records of this cryptically coloured little beetle suggest it may well be under-recorded in comparison with some of the other cerambycids.

APPENDIX 2 (Contd.)

Cavan: 3 April 1943, Farnham, on Hedera, coll. R. C. Faris in NMI.

Galway: ?, Kylebrack, coll. Quirke, in NMI.

Kerry: May 1935, Killarney, coll. E. F. Bullock, in NMI; 23 July 1928, Caragh Lake, coll. E. F. Bullock, in NMI; September 1953, Flesk, Killarney, coll. E. F. Bullock, in NMI; March 1934, Ardagh, Killarney, coll. E. F. Bullock, in NMI; 26 September 1931, Ross, Killarney, coll. E. F. Bullock, in NMI.

Wicklow: 23 November 1933, Clara, coll. A. W. Stelfox, in NMI.

Pseudallosterna livida

The only Irish record of this species is of two specimens collected by Halbert at Mote Park in Co. Roscommon. These specimens are in the NMI collections. The species should be regarded as endangered in Ireland.

Rhagium bifasciatum

This cerambycid has been able to establish itself in the cut stumps of conifers left behind in commercial plantations after tree harvesting. It probably occurs wherever there are conifer plantations in Ireland. As the records below show, it is also frequent in rotten stumps of various deciduous trees, including oak and alder. I have even found it living in 2000 year old pine stumps dug out from beneath bogs (Speight, 1985b).
Available records are as follows:

Cavan: 9 June 1941, Caunoo, coll. R. C. Faris, in NMI; 26 June 1941, Farinseer, coll. R. C. Faris, in NMI; 11 May 1941, Gartinardress, coll. R. C. Faris, in NMI.

Galway: 14 February 1976, M4202, in rotten wood, deciduous woodland, coll. MCDS; 8 April 1982, M1057, rotten conifer stump, scrub on limestone pavement, coll. MCDS.

Kerry: ?, Killarney, coll. E. F. Bullock, in NMI.

Laois: 22 May 1976, S3380, fen woodland, coll. MCDS.

APPENDIX 2 (Contd.)

Leitrim: 9 May 1941, Killbracken, coll. R. C. Faris, in NMI; 27 May 1986, N1091, Clooncoe Wd., Betula/Salix woodland beside lake, coll. MCDS.

Limerick: 25 June 1975, R6820, mature conifer plantation, coll. MCDS.

Mayo: 9 March 1982, M0659, in pupal cell in rotten Alnus, deciduous woods on lake shore, coll. MCDS.

Offaly: 6 June 1976, N5623, scrub, edge of valley bog, coll. MCDS.

Sligo: 20 February 1976, G7733, in rotten Quercus, deciduous woods, coll. MCDS; 22 May 1985, G7343, Glencar, deciduous woods, coll. MCDS.

Tipperary: 17 April 1976, R9727, in rotten Larix stump, mixed woods, coll. MCDS; 17 July 1979, R8821, mixed woods along stream, coll. MCDS.

Westmeath: 1 May 1986, N3761, L. Owel, in rotten Salix log, fen carr, coll. MCDS.

Wexford: 25 May 1975, T1124, flying in sun, conifer plantation, coll. MCDS.

Wicklow: 4 May 1975, T1191, in log, mixed woods, coll. MCDS; 28 October 1982, O1917, rotten conifer stumps, conifer plantation at 750 ft. alt., coll. MCDS; 27 June 1984, T1890, Quercus woods, coll. MCDS; 7 March 1984, O2611, in Quercus and Pinus sylvestris stumps, coll. MCDS.

Rhagium mordax

Like R. bifasciatum, R. mordax larvae commonly inhabit cut stumps. The larvae of R. mordax utilise a wide range of deciduous trees, while R. bifasciatum is characteristically found in conifers. In Ireland, R. mordax is less frequently encountered than R. bifasciatum, but is nonetheless widely distributed. Available records:

Cavan: 4 June 1939, Castlehamilton, coll. R. C. Faris, in NMI.

Galway: 29 March 1975, M4103, Garryland Wd., under bark of log, deciduous woods, coll. MCDS; 15 February 1975, M8303, in pupal cells under bark, rotten stumps beside lake, cleared deciduous woodland, coll. MCDS.

Kerry: 19 April 1975, V8362, in Betula log, deciduous woods, coll. MCDS; 1909 on, many specimens, Killarney, Coll. E. F. Bullock, in NMI.

APPENDIX 2 (Contd.)

Laois: 28 June 1979, N5203, mixed woods, coll. MCDS; 16 July 1979, S4282, Quercus woods, coll. MCDS.

Offaly: 24 April 1984, N3122, Charleville Wd., under bark of rotten Ulmus and on Prunus spinosa flowers, coll. MCDS.

Westmeath: 19 June 1976, N0446, Quercus woods, coll. MCDS.

Wicklow: 20 April 1982, T2598, Quercus woods, coll. MCDS.

Stenurella melanura

This species is included as indigenous on the strength of a specimen without locality data, labeled "Ireland", in the NMI collections. This specimen is mentioned by Kaufmann (1948). Assuming the species to be indigenous, it has to be regarded as endangered here.

Tetrops praeusta

This species has not been seen in Ireland since it was added to the Irish list by Stelfox (1935), who recorded the species from beside the R. Barrow, at St. Mullins in Co. Carlow. It should be regarded as endangered in Ireland, based on available evidence, but could easily prove to have been under-recorded.

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A SURVEY OF AQUATIC COLEOPTERA IN CENTRAL IRELAND AND THE BURREN.

D. T. Bilton

Introduction

During the period 6 - 18 August 1986 a total of 44 sites in Central Ireland and the Burren were sampled for water beetles. Particular attention was paid to ancient fens since these usually contain rich Coleoptera communities including flightless post-glacial relict species. The opportunity was also taken to visit a number of turloughs and these were found to have their own characteristic assemblage of water beetles. This community is probably found nowhere else in the British Isles and would obviously merit further study.

List of sites

The following list gives basic details for each locality visited such as grid reference, habitat, county and vice-county. The sites are numbered from 1 - 44, and these numbers will be used later to indicate where each species was found.

Westmeath (H23)

(1) Loch Ennel, (N 4249): Wave-washed lake shore with stones and mats of dead vegetation plus dense Phragmites and Glyceria bed.

(2) Scragh Bog (N 4259): Mosaic of floating sedge fen, Sphagnum bog and Juncus swamp.

(3) Slevins Loch (N 4655): Rich mossy fen at lake edge with Carex, Equisetum, Juncus etc. Also sedge beds near water margin.

(4) Lake nr. Ballinafid (N 4160): Mossy fen with Carex and Menyanthes below Salix carr. Also a Phragmites bed in the lake edge.

(5) Royal Canal at Saunders Bridge (N 4553): Muddy edge with marginal grasses, Sparganium and Myosotis.

(6) River Gain (N 4559): Stony flooded river with some submerged moss beds.

(7) Canal Supply (N 4454): Richly vegetated margins with grasses, Carex, Juncus and mosses.

(8) Loch Sheever (N 4755): Fen at SE end of lake with richly vegetated reed beds and pools amongst Calluna.

(9) Royal Canal at Shanonagh Bridge (N 3653): Richly vegetated canal with Myriophyllum, Myosotis and Juncus.

(10) Fen at N. end of Loch Owel (N 3761): Mossy swamp amongst Juncus, Phragmites and Menyanthes.

(11) Royal Canal at Coolnahay Bridge (N 3554): Dense Glyceria maxima (Hartman) bed over silt.

(12) Loch Owel (N 3857): Mossy swamp at stony lake edge.

(13) Ditch (N 3762) nr Bunbrosna: Narrow ditch packed with Juncus, Iris and Phalaris etc.

(14) Walshestown fen (N 3954): Old peat cuttings in ancient fen filled with mosses, Juncus, Phragmites, Menyanthes etc.

(15) Lacys Canal (N 4250): G. maxima and Phalaris in deep water at edge.

(16) Stream (N 3261) nr Willifield House: Swift mossy stream with marginal grasses.

(17) Royal Canal at Ballyncarrigy (N 3059): G. maxima, algae and Myriophyllum in canal edge.

(18) Irishtown River (N 2857): Swift muddy stream with marginal grasses.

(19) Royal Canal at Kilpatrick Bridge (N 4152): G. maxima in canal edge.

(20) Mount Dalton Loch (N 3153): Sedge fen on marl at lake edge.

(21) Fen (N 4463) nr Monintown: Floating moss and Potentilla mats over deep water in old peat cuttings in ancient Salix carr.

(22) Bishops Loch (N 4964): Floating grass mats over water polluted by farm run-off.

(23) Pond (N 4562) nr. Cruckboeltane: "Improved" turlough area in flood with grassy edges, Chara, Polygonum and Juncus beds.

(24) Loch Patrick (N 4363): Carex bed in lake edge.

(25) Fen (N 4761) nr. Galmoylestown: Mossy Carex and Juncus swamp in field edge.

Longford (H24)

(26) Cordara turlough (N 0263): Flooded grassy turlough with mossy swamp in margins.

(27) Fortwilliam turlough (N 0162): Flooded turlough with mossy Carex swamp in edge.

(28) Peat cuttings (N 1572) nr. Lisduff Cross Roads: Sheer-sided cut with no vegetation on edge of raised bog.

(29) Pool and ditch (N 0572) nr. Derraghan Cross Roads: Pond with Sphagnum and Carex plus weedless ditch on edge of raised bog.

(30) Pools (N 0769) nr. Killashee: Sphagnum ponds on the edge of cut bog.

Clare (H9)

(31) Turlough marsh (R 2981) nr. Ballycullinan Loch: Grasses, Carex and Juncus in edge of marshy pool.

(32) Pool (R 2994) nr. Rinnamona: Muddy Carex and Menyanthes swamp on edge of permanent pool.

(33) Flood-plain fen at SE. end of Loch Cullaun (R 3089): Carex swamp with a fringe of Schoenoplectus in deep water.

(34) Flood-plain fen at W. end of Loch Atedaun (R2887): Carex and Juncus swamp in deep water.

(35) Turlough (R 3195) at Mullagh More: Flooded turlough with Potentilla fruiticosa L., Carex and mosses in edge.

(36) Fen (R 3292) nr. Kinroe House: Marsh with Scorpidium and other mosses in Carex and Cladium beds.

(37) Castle turlough (R 3597): Grassy edge of recently flooded turlough.

(38) River Fergus (R3688): River in flood with mosses and plant debris.

(39) Travaun Turlough (R 3596): Mossy Carex swamp in shallow water at edge of turlough.

(40) Carran turlough (R 2897): Grassy turlough in semi-improved area.

(41) Carran depression (R 2999): Carex and Menyanthes swamp at edge of permanent pools.

(42) River Fergus (R 2888): Swift river with gravel beds and overhanging banks.

(43) Caher River (M 1508): Fast stream with algae-encrusted rocks and no vegetation.

(44) Marsh (R 5458) nr. Limerick: Rich fen with Juncus, Carex, Parnassia and Alnus/Salix carr.

Species found

There now follows a list of the beetles collected in taxonomic order. Notes are given concerning the habitat and occurrence of each in the British Isles followed by a rundown of the sites in which they were taken. Distributional information is based on Balfour-Browne (1940 - 1958) and Foster (1981 - 1987) with additions where appropriate. The site numbers are those used in the previous locality list. An asterisk (*) indicates a species new to Ireland and a cross (+) a species not recorded since 1950.

HALIPLIDAE

Brychius elevatus (Panzer). This is a rather local species found in swift running water. In Ireland it can be found in the extreme West, whereas in Britain it is usually absent from such districts. 6, 16, 18, 42.

Haliplus flavicollis Sturm. A widespread species which is usually found in the larger well-vegetated water bodies, either natural or artificial. Seemingly scarce in Ireland. 7.

Haliplus fulvus (Fabricius). A species living in similar situations to the above with which it is often associated. 7, 17, 23, 37.

Haliplus immaculatus Gerhardt. A widespread but local beetle of lowland areas. Found mostly in larger water bodies and drains. 15, 17, 19, 24.

Haliplus lineatocollis (Marsham). This insect is eurytopic and widespread. It perhaps shows a preference for small base-poor streams where it can be co-dominant. 1, 5, 7, 9, 11, 18, 29, 36, 37, 40, 42.

Haliplus lineolatus Mannerheim. Widely distributed with a preference for clear water. 5, 8, 13, 15, 19.

Haliplus obliquus (Fabricius). A local beetle usually associated with Chara in clear open water. 9, 20, 29.

Haliplus ruficollis (Degeer). This is another eurytopic species which unlike most Haliplus species can frequently be found in fens lacking open water. 5, 7, 8, 9, 11, 15, 19, 20, 23, 29, 33, 41.

Haliplus wehnckei Gerhardt. Widespread in deep open water amongst vegetation. 1, 7, 15, 29.

NOTERIDAE

Noterus crassicornis (Müller). The smaller Noterus is a very local relict brachypterous species of ancient lochs and old fen areas (Jackson, 1973). 8, 19, 33.

DYTISCIDAE

Laccophilus minutus (L.). This small diving beetle is widespread, occuring mainly in permanent water bodies with decaying vegetation. 1, 7, 23, 26.

Hyphydrus ovatus (L.). A beetle which is widespread, being found in large permanent water bodies in lowland areas. 1, 5, 7, 9, 11, 17.

Hygrotus inaequalis (Fabricius). A very common species, especially in places with much rotting vegetation and detritus. 1, 7, 8, 9, 11, 13, 19, 26, 28, 33, 35, 36, 41.

Hygrotus quinquelineatus (Zetterstedt). This is a flightless species living in old lochs and drains in fen areas. It seems to be far commoner in Ireland than it is in Britain. 1, 5, 9, 17, 19, 23, 26, 27, 35.

Hygrotus versicolor (Schaller). A local species of permanent water. Often in sites on clay or rich in vegetation. 1, 7.

Coelambus impressopunctatus (Schaller). Widespread, occuring mainly in shallow grassy pools of a temporary nature. 26, 31, 35.

Hydroporus angustatus Sturm. A rather local species of eutrophic and mesotrophic fen conditions. Not, however, restricted to ancient sites. 2, 3, 4, 13, 14, 25, 36, 44.

Hydroporus erythrocephalus (L.). A common beetle found in stagnant water bodies, bogs and fens. 2, 3, 10, 14, 15, 21, 26, 32, 34, 35, 36, 40, 41.

*Hydroporus glabriusculus Aubé. This species was introduced to the British list by Sinclair (1975). It is a post-glacial relict species being found in a few ancient fens in the Scottish Borders and flooded periglacial hollows in the Norfolk Breckland. The beetle was discovered new to Ireland from four old mesotrophic fens around Mullingar, sometimes being the commonest Hydroporus species present. These records constitute an important extension in the known distribution of a species which is rare in much of its range due to the pollution and drainage of ancient fens. 2, 4, 14, 21.

Hydroporus gyllenhali Schiödte. This is a common species of acid waters, being found wherever the habitat exists. 2, 8. 10, 13, 14, 21, 25, 27, 28, 29, 30.

Hydroporus incognitus Sharp. A beetle of pools with undecayed vegetable refuse, usually in fairly acid areas in woodlands and bogs. Widespread and often abundant. 14, 29, 31, 44.

Hydroporus memnonius Nicolai. This is a widespread beetle most often found in shallow shaded pools with much undecayed leaf-litter. The species has a dimorphic female, and the distribution of the two forms in the British Isles is of some interest. The shining form is found North of a line which runs across Britain, roughly at the level of the Scottish Border. South of this the main form found is the matt var. castaneus Aubé. In a few places on the West coast of England and Wales the shining form can be found well South of its usual range. It is interesting to note that all the Irish females I found were of the shining form, suggesting that this variety has a northern and western distribution in the British Isles. Balfour-Browne (1940) also notes that he knows of no matt females from Ireland. 4, 10, 14, 21.

Hydroporus nigrita (Fabricius). A common and widespread species most often found in shallow water amongst vegetation. 2, 8, 13, 14, 21, 25, 44.

Hydroporus obscurus Sturm. Northern and western in Britain being found most often in Sphagnum bogs and poor fens. 2, 10, 14, 30, 32, 36.

Hydroporus palustris (L.). A eurytopic species commonest in permanent stagnant water bodies where few other Hydroporus spp. occur. 1, 3, 5, 11, 17, 19, 23, 27, 32, 33, 34, 35, 36, 37, 39, 40, 41.

Hydroporus planus (Fabricius). A common lowland species most often found in shallow ephemeral pools with submerged grass and silty bottoms. Like most strong fliers it can, however turn up almost anywhere. 2, 7, 8, 13, 14, 15, 17, 21, 23, 24, 25, 27, 29, 30, 31, 33, 35, 39.

Hydroporus pubescens (Gyllenhal). This is a strong flier which turns up in a wide range of waters. 7, 11, 14, 21, 25, 28, 29, 30, 36, 37, 39, 44.

*Hydroporus scalesianus Stephens. Like H. glabriusculus this is a flightless relict species occuring in ancient fens. Modern British records exist only for Norfolk with two outlying sites in Cumberland and Durham (Bilton, 1984; Horsfield and Foster, 1983). Again the beetle is rare and endangered across most of its range and the Irish sites are therefore of international importance. In both its Irish localities H. scalesianus was found in company with other relict species such as H. glabriusculus and Laccornis oblongus (Stephens) in clear water amongst floating moss and plant carpets. 2, 21.

Hydroporus striola (Gyllenhal). A widespread species of fen habitats, which is capable of occuring in secondary sites. 2, 3, 8, 11, 20, 21, 25, 26, 27, 31, 33, 34, 36, 44.

Hydroporus tesselatus Drapiez. Widespread, often in temporary waters. Probably a species whose distribution is limited by a lack of tolerance to severe frosts. 1, 2, 3, 10, 12, 13, 28, 39.

Hydroporus tristis (Paykull). A widely distributed beetle of acid water in bogs and poor fens. 2, 8, 30. 36.

Hydroporus umbrosus (Gyllenhal). This beetle is often found together with H. striola as it is also predominantly a fen species. 2, 10, 14.

Suphrodytes dorsalis (Fabricius). A fen species which is also tolerant of woodland cover. Perhaps characteristic of late succession to fen woodland (Foster, 1984). Southern in Britain, but apparently more widespread in Ireland; old records existing for Ulster. 2, 3, 10, 13, 14, 28, 31, 34.

Stictonectes lepidus (Olivier). Mostly found in pools on peat, sand and gravel and in base-poor streams. Has rapidly declined in Britain in recent years but seems to be still fairly frequent in central Ireland, being found in most sites which appeared suitable. 5, 7, 11, 28, 29.

*Graptodytes bilineatus (Sturm). In Britain, this beetle in associated with a few sites in southern coastal districts. Its restriction to these warm thermal refugia is probably due to frost sensitivity since in more southerly areas of Europe it can be found well inland in mossy temporary waters. In Ireland the species was discovered in Longford and Clare in mossy turlough edges together with Agabus labiatus (Brahm). These situations are reminiscent of those inhabited by G. bilineatus in Spain and Southern France. The mild

Atlantic climate of Ireland is probably what allows the species to penetrate inland areas from which it would usually be absent in the British Isles. The Graptodytes is unknown in such situations in Britain, so the Irish sites are of great interest and importance. 26, 27, 35, 39.

Graptodytes granularis (L.). An uncommon flightless beetle found in ancient mesotrophic fens and ditches in drained fen areas. 2, 4, 10, 14, 21, 36.

Graptodytes pictus (Fabricius). Fairly abundant and widespread in permanent waters amongst vegetation. 5, 7, 15, 17, 19, 29.

Porhydrus lineatus (Fabricius). This beetle is found in clear water in lowland areas amongst vegetation. 7, 8, 9, 11, 19, 20, 26, 27.

Potamonectes assimilis (Paykull). In clear open water in dykes and lakes. 5, 7, 9, 13, 17.

Potamonectes depressus depressus (Fabricius). This subspecies is rather rare in northern lochs in Britain. It is, however, the only form known in Ireland where it is widespread and abundant in drains, rivers and lakes. 1, 5, 7, 12, 38, 42.

Stictotarsus duodecimpustalatus (Fabricius). This beetle is widespread in the clear water of rivers and less often lakes. Apparently rare in Ireland. 33.

+Laccornis oblongus (Stephens). Another flightless species of ancient mesotrophic fens and bogs. Rare in Britain, being mainly found in the Scottish Borders and Norfolk. One Irish record exists for early this century. L. oblongus was rediscovered in several sites around Mullingar, which seemingly is one of the best areas in Western Europe for this species. 2, 3, 14, 21, 25.

Copelatus haemorrhoidalis (Fabricius). A local species of fens, pools and ditches rich in vegetation. Its distribution is limited to warmer areas. 2, 35, 36.

Agabus affinis (Paykull). Locally distributed in mossy fens and bogs. 2, 4, 14, 21.

Agabus bipustulatus (L.). A very common and eurytopic beetle. 2, 3, 4, 7, 8, 10, 13, 14, 21, 23, 25, 27, 28, 29, 30, 31, 32, 34, 36, 37, 39, 40, 41.

Agabus labiatus (Brahm). This beetle is flightless and very local, being found in ancient temporary waters, mainly in old fen areas. In Ireland, it was very common in all the undisturbed turloughs examined, being characteristic of these habitats. 26, 27, 35, 37, 39.

Agabus melanocornis Zimmermann. A widespread species mainly found in acid pools in woodland and bog. Apparently scarce in Ireland. 29.

Agabus nebulosus (Forster). This is a silt pool species which seems to find the conditions it needs in flooded turlough areas. 23, 26, 27, 35, 37, 39.

Agabus paludosus (Fabricius). A species of shallow grassy streams which is apparently rare in central Ireland. 24.

Agabus sturmi (Gyllenhal). Fairly common and widespread preferring sites rich in fine organic detritus. 3, 7, 9, 13, 14, 15, 28, 29, 34, 35.

Agabus unguicularis Thomson. A local species of shallow water, usually in mossy fens. 2, 3, 10, 25, 31, 40.

Ilybius ater (Degeer). Widespread, usually in rich and often muddy fens. 1, 2, 3, 7, 13, 14, 26, 29, 33, 34, 35, 40.

Ilybius fuliginosus (Fabricius). Common and eurytopic, being most abundant in grassy stagnant waters. 1, 3, 5, 7, 8, 9, 11, 13, 15, 17, 18, 19, 20, 23, 27, 28, 29, 31, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42.

Ilybius guttiger (Gyllenhal). A very local species of mossy areas in ancient fens and bogs. Only one previous Irish record. 2, 4, 8, 14, 21, 25, 36.

Ilybius quadriguttatus (Lacordiare and Boisduval). This is mainly a fen insect, often found in similar situations to I. ater. 2, 3, 7, 9, 10, 13, 14, 17, 19, 24, 29, 34, 36, 44.

Rhantus bistriatus (Bergstraesser). A rather scarce species found mainly in pools in Sphagnum bogs. Only one other post-1950 Irish record. 36.

Rhantus exsoletus (Forster). This beetle is associated with old fenland areas where it is most often found in flooded Carex beds. 1, 3, 7, 8, 9, 15, 17, 27, 31, 33, 35.

Rhantus frontalis (Marsham). This rare species has a disjunct distribution in the British Isles. There are a set of records ranging from Ireland to Angus and a few isolated populations in ancient fen areas in Southern England where it is probably a relict species. It is associated with stagnant water, usually on sand or peat. 27.

Rhantus grapii (Gyllenhal). Found in well-vegetated pools, ditches and marshes, usually in ancient fen areas. 2, 3, 7.

Colymbetes fuscus (L.). A common and widespread species which is most abundant in shallow water amongst dense beds of marginal grass. 4, 7, 8, 13, 26, 27, 28, 31, 34, 35, 37.

Hydaticus seminiger (Degeer). Recently rediscovered in Ireland this beetle is found in well vegetated areas in ancient fen regions. Very rare in western Britain, being found mainly in Norfolk and the extreme south-east. 1, 3, 10, 33, 34.

+Acilius canaliculatus (Nicolai). A rare beetle of peat pools and acid fen carr which is associated with large expanses of ancient wet heath and peat bog. Now very scarce in Britain outside the Scottish Borders and the East Highlands (Bilton, 1987). 28.

+Acilius sulcatus (L.). A scarce species of small permanent pools usually on sand or peat. Has probably declined in much of Britain this century. 28.

+Dytiscus circumcinctus Ahrens. Very local in ponds and ditches, usually in ancient fen areas. This is the only modern Irish site, but the beetle was abundant in this ditch, so could be expected elsewhere in the Mullingar area. 13.

Dytiscus marginalis (L.). Widespread and abundant. 1, 7, 9, 11, 13, 15, 27, 28.

Dytiscus semisulcatus Müller. In Europe this is predominantly an oceanic species which is still abundant in Ireland and Western Britain but has declined to the verge of extinction in Eastern Europe (Foster, 1986). Usually found in places with dense beds of grass or other vegetation. 3, 9, 13, 18.

GYRINIDAE

Gyrinus aeratus Stephens. This is a rather rare species found in ancient peaty lochs and rich drains, mainly in old fen areas. 5, 7.

+Gyrinus bicolor Fabricius. A rare species of reedbeds in the edges of ancient lakes and similar places in old fen areas. Probably more common in Ireland than it is in most of Britain. 4, 8, 33.

Gyrinus caspius Ménétriés. A local species of open water which is mainly coastal in much of Britain. The fact that its excursions inland occur in Scotland suggests that this pattern is not frost-related as is usually the case. 1.

+Gyrinus distinctus Aubé. This is a rare beetle in Britain, being found mostly in a few ancient lakes in the North and West. 3.

Gyrinus marinus Gyllenhal. This species occurs in flotillas in open water at the edge of reedbeds. It is mainly lowland in occurrence. 3, 5, 8, 33.

Gyrinus minutus Fabricius. Mostly a scarce upland species of peat pools. G. minutus also exists as a relict in the lowlands around extensive areas of raised bog, as is the case in central Ireland. 30.

Gyrinus substriatus Stephens. Very common and found in most places with sufficient water for it to gyrate on. 8, 11, 12, 15, 18, 28, 33, 35.

Orectochilus villosus (Müller). A species of western rivers and lakes, usually in places with stony edges or overhanging banks on which it beaches during the day. 3, 12, 16, 42.

HYDROPHILIDAE

+Hydrochus ignicollis Motschulsky. This is a rare species living in ancient fens and other suitable habitats. 8.

Helophorus aequalis Thomson. A widespread and common species which is a strong flier. Most often found in shallow grassy pools in Spring. 3, 13, 20, 25, 29, 37.

Helophorus brevipalpis Bedel. One of the commonest of British beetles this species is a ready flier and can be found in almost any place with a trace of water. 1, 2, 3, 4, 7, 9, 10, 11, 12, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 28, 30, 31, 34, 37, 39, 40, 42, 44.

Helophorus flavipes (Fabricius). Widely distributed and most common in acid waters amongst Sphagnum, Juncus or grasses. 2, 10, 14, 21, 24, 30.

Helophorus grandis Illiger. A common and widespread species often found in small puddles. Probably prefers shallow water sites. 2, 12, 13, 18, 21, 26, 29, 33, 37, 38, 42.

Helophorus minutus Fabricius. This species is widespread and typical of shallow grassy pools where it can be the dominant member of the genus. It is capable of occuring in many biotopes in addition to this. 26, 35, 37.

Helophorus obscurus Mulsant. Common but seasonal, being most often found in

Spring in shallow neutral/basic water amongst Juncus and grasses. 13, 37, 40.

Coelostoma orbiculare (Fabricius). A rather local species which is characteristic of flooded moss beds, mostly in fens. 2, 4.

Cercyon convexiusculus Stephens. Rather local, being found in wet detritus; mostly in old fens. 2, 4, 13, 22, 25.

Cercyon tristis (Illiger). As above but a little less common; more northern in Britain. 26.

Cercyon ustulatus (Preyssler). Widespread but not very common in wet detritus at the water's edge. 7, 31.

Paracymus scutellaris (Rosenhauer). An uncommon species with a south-westerly distribution in Britain. Found in mossy pools and seepages. 30.

Hydrobius fuscipes (L). Common and widespread in all types of water; mostly amongst vegetation. 1, 2, 3, 12, 14, 21, 25, 26, 27, 28, 29, 31.

Anacaena globulus (Paykull). A very common and eurytopic water beetle. 1, 4, 7, 10, 13, 14, 24, 25, 26.

Anacaena limbata (Fabricius). Another widespread and common species. 2, 3, 4, 5, 10, 13, 14, 24, 25, 36.

Anacaena lutescens (Stephens). A species recently split from A. limbata which also appears to be widespread in Britain (Henegouwen, 1986). 7.

Laccobius biguttatus Gerhardt. Widespread but local, mostly in places with vegetation over gravel and silt. 24.

Laccobius bipunctatus (Fabricius). Common especially in sites rich in detritus. 3, 13, 18, 19, 24, 29, 40, 41.

Laccobius minutus (L.). As above, but slightly less frequent. 12, 35.

Laccobius striatulus (Fabricius). Widely distributed and usually found in stream edges and pools amongst clay. 18.

Helochares punctatus Sharp. A very local species of Sphagnum pools etc. H. punctatus was only recently recognized as a distinct species (Hansen, 1982). 28.

Enochrus coarctatus (Gredler). A fairly common beetle found amongst flooded detritus etc. in fens. 2, 3, 12, 13, 14, 15, 25, 36.

Enochrus ochropterus (Marsham). Local in fens and bogs. 36.

Enochrus fuscipennis (Thomson). Local in Sphagnum bogs. Hansen (1987) treats this as a species distinct from E. quadripunctatus (Herbst). 29.

Cymbiodyta marginella (Fabricius). This is a rather local species of shallow water rich in vegetation and detritus. 2, 8, 21, 31.

Chaetarthria seminulum (Herbst). A widespread species usually found in fens and seepages amongst wet moss or liquid mud. 2, 4, 7, 12, 14, 20, 36.

*Berosus signaticollis (Charpentier). A rare beetle found most often in ponds on fine silt or clay. B. signaticollis was discovered in Ireland from two turlough sites in Longford and Clare. The fact that it occurred in such sites in two widely separated areas suggests that in Ireland it may be characteristic of this type of water body. 26, 35.

HYDRAENIDAE

Ochthebius minimus (Fabricius). This species is widespread and common in a wide range of aquatic habitats. 12, 26, 39.

Hydraena britteni Joy. Local but often abundant in shallow pools with dead leaves etc. mostly in fen carr. Also found in a wide range of biotopes 1.

Hydraena gracilis Germar. A widely distributed species living in moss in fast streams and rivers. 43.

Hydraena nigrita Germar. A rare species of fast streams and rivers. 42.

Hydraena riparia Kugelann. Common, especially in places rich in detritus. 2, 4, 9, 13, 14, 21, 42.

Hydraena testacea Curtis. Local in ponds, fens and rivers. 8.

Limnebius truncatellus (Thunberg). Common especially in small streams. 7, 9, 13, 15, 18, 29, 44.

ELMIDAE

Elmis aenea (Müller). This beetle is widespread and abundant in moss on stones in swiftly flowing water. It can also be found on stony, wave-washed lake shores. 1, 6, 16, 18, 42, 43.

Limnius volckmari (Panzer). Often abundant in gravels etc. in swift waters. 42.

Oulimnius tuberculatus (Müller). Often common in well oxygenated water over gravel in pools, ditches, rivers and lakes. 16, 42.

DRYOPIDAE

Dryops luridus (Erichson). Widespread and fairly common in moss etc. at the water's edge. 15, 18, 21, 25, 27, 29, 36, 39, 40.

*Dryops similaris Bollow. A rare species most often found in ancient fen areas. In Britain I know little about its habitat, but I understand that in Spain it can be taken in shallow mossy pools (Foster, pers. comm.) as is the case with the Irish turloughs. 26, 31.

STAPHYLINIDAE

Stenus bifoveolatus Gyllenhal. A common species of fens and other marshy places. 1, 3, 10, 20.

Stenus carbonarius Gyllenhal. A very local species of lowland bogs and richly vegetated lake shores. 33, 40.

Stenus cicindeloides (Schaller). Common and not always found near the water. 22.

Stenus flavipes Stephens. Local, especially in leaf and grass litter in fen carr. 22, 29.

Stenus juno (Paykull). A common beetle of wet places. 1, 2, 4, 13, 25.

Stenus latifrons Erichson. Common in very wet fens and on eutrophic lake shores. 2, 3, 4.

Stenus nitens Stephens. Abundant in Ireland in very wet marshes and fens (Anderson, 1984). 2, 3, 14.

Stenus nitidiusculus Stephens. A common species of damp places. 2, 3, 7, 25.

Stenus pubescens Stephens. Widespread in damp places and marshes. 24.

Stenus tarsalis Ljungh. Fairly common on richly vegetated lakeshores and riverbanks. 33.

Stenus umbratilis Casey. Local in Carex beds in marshes and lake edges etc. 3.

Encephalus complicans Stephens. A rare beetle of wet moss and tussocks in marshes and beside rivers. 22.

CHRYSOMELIDAE

Donacia clavipes Fabricius. Very local on Phragmites in the edges of lakes 4.

Donacia simplex Fabricius. Widespread on water plants. 7, 24.

Donacia versicolorea (Brahm). Widespread on Potamogeton. 5.

Prasocuris junci (Brahm). Fairly common on water plants. 1, 18.

Prasocuris phellandrii (L.). Common on water plants. 3, 8, 24, 31, 40.

CURCULIONIDAE

Eubrychius velutus (Beck). A rather rare species found on Myriophyllum. 7, 9, 17.

Discussion

A total of 131 species of aquatic and wetland Coleoptera were recorded during the survey which covered 44 sites and lasted two weeks. Of these, five (Hydroporus glabriusculus, H. scalesianus, Graptodytes bilineatus, Berosus signaticollis and Dryops similaris) were new to Ireland and six (Laccornis oblongus, Acilius canaliculatus, A. sulcatus, Dytiscus circumcinctus, Gyrinus bicolor and G. distinctus) had not been noted since 1950. The localities visited can be broadly divided, with a few exceptions, into five groups on ecological grounds, these being:

- Streams and rivers
- Royal Canal and associated habitats
- Lake margins lacking old fen developments
- Ancient fens and bogs
- Turloughs

Most streams or rivers sampled were disappointing from a water beetle viewpoint. In the central region a great many were in spate making collecting difficult, but in addition to this most were canalized or appeared to be regularly cleared, to the detriment of their fauna. A search for the western riverine rarity Bidessus minutissimus (Germar) in the Burren also proved unsuccessful since the only suitable river in this karstic area, the Fergus, failed to produce the species.

The Royal Canal and its tributaries produced a good many species of interest, but site quality varied from place to place. Some sampling points (at Ballynacarrigy, Site 17 for example) were probably enriched by run-off from surrounding farmland. The vegetation at such sites was far less rich and varied than it was at places such as the Canal Supply (Site 7), where run-off was probably minimal. Water beetle communities were similarly less diverse in the polluted stretches (13 spp. at Ballynacarrigy with 35 spp. in a similar time at the Canal Supply). Nutrient enrichment would appear to be one of the greatest threats to such ecosystems.

Lake margins lacking fen development were rather scarce, but nevertheless those investigated produced a number of Gyrinus spp. which are characteristic of such sites.

The main purpose of the survey was to investigate the water beetle fauna of the central fen area, since this was the last such area in the British Isles to be left virtually unrecorded for aquatic Coleoptera. In the area around Mullingar a large number of relict fens and bogs still exist in a fairly natural state, most being apparently unaffected by agricultural enrichment. This region probably contains one of the most extensive concentrations of undamaged sites for relict fen Coleoptera in Western Europe and is therefore of international importance. Many such sites have developed around the edges of lakes. Such a situation is uncommon in much of Britain, where agriculture often extends to the water's edge. As was hoped mossy swamps in ancient mesotrophic fens produced three species of flightless water beetle which are indicative of very old wetlands. These were Hydroporus glabriusculus, H. scalesianus and Laccornis oblongus, species which are now endangered in much of Europe. Of the sites visited, Scragh Bog (Site 2) and a fen near Monintown (Site 21) contained all three species.

The turloughs are a type of water body which is more or less exclusively Irish in the British Isles, and their water beetle community would also seem to be special. In the margins of an undisturbed turlough one could expect a beetle assemblage characterized by some or all of the following:

Hygrotus quinquelineatus
Coelambus impressopunctatus
Graptodytes bilineatus
Agabus labiatus
A. nebulosus
Helophorus spp. other than *H. brevipalpis*
Berosus signaticollis
Dryops similaris

This apparent 'turlough community' seems to be very susceptable to disturbance such as heavy grazing/trampling of the margins or agricultural 'improvement' of the surrounding land. The most sensitive species are the edge moss dwellers such as *G. bilineatus*, *A. labiatus* and *D. similaris*. In order to preserve this special assemblage of beetles the above mentioned factors must be avoided. Since this community seems to be unknown elsewhere in the British Isles, the Irish turloughs would merit a more extensive sampling programme in the future.

This survey has been far from exhaustative, but it has demonstrated that the fens and turloughs of Ireland are very worthwhile areas for work on water beetles.

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FIVE CHIRONOMIDAE (DIPTERA) NEW TO IRELAND.

Declan Morgan and Declan A. Murray

Introduction

Additions to the inventory of Irish Chironomidae by Ashe (1987) and Heneghan and Murray (1987) increased the national chironomid total to 364 species from 119 genera. Subsequent sampling of a small montane river in Co. Wicklow has yielded three hitherto unrecorded species from Ireland. A further two species have been taken from other sites in the country and are recorded in this paper. The five species are listed below, briefly annotated with information on the site of capture, date, autecology and supplementary distribution. Voucher material of all the species has been deposited in the National Museum of Ireland, Dublin. Pending the publication of records of two additional terrestrial species (Bond *et al*, 1988), the Irish chironomid faunal list now includes 371 species from 119 genera.

Subfamily Tanypodinae

Thienemannimyia geijskesi (Goetghebuer)

A single pupal exuviae was collected from the Glencullen river, Knocksink Wood, Co. Wicklow (O 217177) on 18.5.1987 (leg. Morgan). The species is easily distinguished from other members of the genus as it possesses only three lateral filaments on segment I (Fittkau, 1962; Langton, 1984). Larvae of the genus are considered to be polyoxybiontic and cold stenothermic. In cool to temperate latitudes and montane regions, they inhabit the littoral as well as the profundal zones of oligotrophic lakes (Fittkau and Roback, 1983). *T. geijskesi* is a rhithral species occurring in upland areas of central Europe (Fittkau and Reiss, 1978). Langton (*op. cit.*) records a solitary specimen from a stream in the Kincardine district of Scotland. This observation and the one recorded here extend the species western Palaearctic distribution, although it is probably a rarity in its range. The genus *Thienemannimyia* Fittkau has been recorded from all zoogeographical regions with the exception of the Neotropical, however, Ashe *et al*. (1987) on the basis of current information imply that it is likely to have a worldwide distribution.

Subfamily Orthocladiinae

Orthocladius (Euorthocladius) luteipes Geotghebuer

Pupal exuviae were obtained in large numbers from the Glencullen (O 217177) and Dargle (O 249178) rivers, Co. Wicklow, from March through May 1987 (leg. Morgan). The species is identifiable on the basis of posterior bands of spinules, three to seven deep, on tergites IV - VIII (Langton, 1984). The subgenus Euorthocladius is subject to taxonomic confusion and is currently being revised by Soponis (pers. comm.). Concerning O.(E.) luteipes, Langton's description accords with Thienemann (1944), but it is likely that inter-specific variation has hampered intervening work. The larvae of this species are rheobiontic and eurythermic. Its distribution is predominantly western Palaearctic, notwithstanding a probable paucity of this information due to its taxonomic indistinctness. It is recorded from the Alps (Fittkau and Reiss, 1978) as well as rivers in Scotland (Langton, op. cit.). Specimens collected by Thienemann in Lappland obtained from the collections of C. F. Humphries evince a Scandinavian dispersion which corresponds with the closely allied O.(E.) rivicola Kieffer. The genus has been recorded from all zoological regions except Antartica.

Subfamily Chironominae

Micropsectra aristata Pinder

Several pupal exuviae were collected on 18.5.1987 and 30.6.1987 from the Glencullen river, Co. Wicklow (O 217177), (leg. Morgan). The species, readily identifiable by the presence of relatively short (25um) spinules on tergite III, was first described by Pinder (1976). Larvae of this genus are particularly characteristic of muddy deposits in slack regions of streams and small rivers (rhithron) and of mesotrophic - oligotrophic lakes, including the profundal zone. Many species are cold stenothermic (Pinder and Reiss, 1983). Distributional data for M. aristata is scant. Pinder (op. cit.) records it from a brook in Dorset, southern England, while Hayes (pers. comm.) has found it throughout the rivers Slaney, Eany and Little Brosna. It is probable that M. aristata has been confused with other Micropsectra Kieffer species in the past, thus accounting for the current paucity of allocational information, particularly from continental Europe. The genus has a Holarctic distribution.

Polypedilum (Pentapedilum)uncinatum (Geotghebuer)

A number of adult males were netted on the wing on 10.7.1987 during a study of the ponds in the grounds of the Royal Zoological Gardens, Phoenix Park, Co. Dublin (O 128352), (leg. Murray). They are separable from other members of the genus on having the lateral seta inserted about two thirds of the way along appendage I (Pinder, 1978). Larvae of Polypedilum Kieffer, which is a large heterogenous genus, occur in virtually all kinds of still and flowing waters, with exception of arctic and high mountains. Sediments are the preferred substratum (Pinder and Reiss, 1983). P. uncinatum has been recorded from lentic habitats in France, Denmark, N. Germany, Russia and Norway (Fittkau and Reiss, 1978). Langton (1984) notes it from northern and montane peat pools and lakes of Scotland and Wales. The genus has a worldwide distribution.

Tanytarsus chinyensis Goetghebuer

Imagines were captured by light-trap at Roundwood Reservoir, Co. Wicklow (O 196132) during July and August 1983 and 1984 (leg. Dauod) and on the wing in Glenveagh National Park, Co. Donegal, in June 1986 by Heneghan (1986). According to Brundin (1949 : 798) the larvae of T. chinyensis are eurybathic, being found at all depths down to the profundal zone, particularly of oligotrophic lakes, with probable maximal larval density occurring "auf den Sedimentboden des mittleren und unten Litorals". Dauod (1986) has categorised Roundwood Reservoir as oligotrophic, while the lakes in Glenveagh have a similar trophic status. However, larvae of the genus are eurytopic, being found in all types of freshwater, apart from some marine species (Pinder and Reiss, 1983). T. chinyensis is known from the Iberian peninsula, the Alps, central Europe and Fennoscandia (Fittkau and Reiss, 1978) while Langton (1984) records it from L. Bala in Wales. The genus has a worldwide distribution with at least 85 named Holarctic species (Pinder and Reiss, op. cit.).

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THE CLADOCERA (CRUSTACEA) OF LOUGH REE AND NEIGHBOURING WATERBODIES IN IRELAND.

Catherine Duigan

Introduction

Lough Ree is the fifth largest lake in Ireland and the second largest lake in the Shannon catchment but its littoral Cladocera have been the subject of little scientific investigation. It has a very shallow limestone basin with most of the lake less than 10 m in depth (Flanagan and Toner, 1975). There are numerous islands and the lake's highly indented shoreline forms a series of sheltered bays and closely connected waterbodies such as Lough Killinure and Creggan Lough (Fig. 1). Many of the bays have a sandy substrate with little macrophyte growth.

In 1899 members of the Dublin Naturalist's Field Club made collections in deep water at an unspecified area of Lough Ree and their findings were recorded by Kane (1900). Only three species of Entomostraca were identified (Table 1). In addition Sida crystallina (O. F. Müller) occurred abundantly among the weeds off St. John's Point and Kane remarked that the material collected was only "cursorily examined and there may be minute species yet overlooked worthy of record". However no additional species were listed for Lough Ree in Kane's revision of Irish Freshwater Entomostraca (1903).

A number of open water plankton hauls were taken in three different areas of Lough Ree in the period 1972 - 74 during a survey by field staff of The Water Resources Division of An Foras Forbartha (Flanagan and Toner, 1975) but Daphnia hyalina Leydig was the only cladoceran recovered. Seventeen species were recorded from twelve collections at two locations within the lake by Fitzmaurice (1977). An additional four chydorid species were recovered from the stomach contents of fish from nearby Lough Killinure (Table 1).

In the present study twelve sites (1 - 12) were sampled on or near the main lake and four additional locations (13 - 16) were sampled in the limestone area south-west of Lough Ree (Fig. 1). This area is a northern extension of the Gort Lowlands whose chief hydrogeological feature is the presence of turloughs. All sites in this area experience sudden annual fluctuations in water level and locations 13, 14, and 15 (see below) may be classified as

true turloughs because in summer these waterbodies may dry out completely. The Cladocera of turloughs are attracting increased scientific investigation. Reynolds (1986) reported on the Cladocera from the Burren turloughs at Mullagh More, Co. Clare. Eurycercus glacialis Lilljeborg, was first recorded in Ireland from four turlough-like waterbodies in the area immediate to Gort town, Co. Galway (Duigan and Frey, 1987a, b). As a result of this study its distribution can now be extended northwards into Co. Roscommon.

Under favourable environmental conditions cladoceran populations reproduce by diploid parthenogenesis. If conditions deteriorate some eggs develop into males rather than females. Concurrently or a short time later the females modify their brood pouches into pigmented ephippia and produce haploid eggs. When fertilized, these eggs become diploid resting eggs encased in the ephippia which are shed when the female molts. Duigan and Frey (1987b) proposed that Cladocera can ensure population survival in turloughs by the production of ephippia which can survive dessication. In the present study the cladoceran population of Coolagarry Lough was monitored at intervals when water levels began to fall at the approach of summer in 1986. Autumnal gamogenetic populations of chydorids were recorded in L. Ree and Creggan L.

Qualitative samples were taken at every location with a hand-held plankton net (mesh size = 0.2 mm) to a depth of 2 m. A brief description of each sampling location is given below. Samples were fixed in 40% formalin in the field. Identifications were made using the taxonomic keys of Scourfield and Harding (1966) and Flössner (1972).

Sampling Locations

Locations 1 to 10 inclusive are on the shores of Lough Ree and they were sampled once on 1 October 1984 (Fig. 1). In addition, Creggan Lough, Killinure Lough and Lough Funshinagh were also sampled on this date. Corkip Lough, Lough Croan and Coolagarry Lough were sampled on 25 April 1986 with the latter site being sampled on four more occasions (Table 2)

1. Hodson's Bay, L. Ree, Co. Roscommon (N 010460)
   Sampled in bed of Typha latifolia with some Chara sp. growing on the bottom. Site was left of boat pier.

2. Site near Warren Point, L. Ree, Co. Roscommon (M 998547)
   Sampled in submerged Carex sp.

3. Galey Bay, L. Ree, Co. Roscommon (M 960583)
   Sampled in submerged Carex sp. near mouth of stream from L. Oura.

4. Portrunny Bay, L. Ree, Co. Roscommon (M 980600)
   Very fine sand substrate. Anodonta sp. found. Sampled in bed of Chara sp.

5. Ballyclare Bay, L. Ree, Co. Roscommon (M 980693)
   Site similar to location four with sandy substrate but no macrophytes growing in the water. Anodonta sp. present.

6. Site near Fermoyle, L. Ree, Co. Longford (M 994630)
   Sample taken in stand of Juncus sp.

7. Elfeet Bay, L. Ree, Co. Longford (N 029570)
   Sandy substrate with moss covered rocks.

8. Saint's Island, L. Ree, Co. Longford (N 070559)
   Sample taken in a mixed bed of Chara sp. and Juncus sp. on the NW side of the peninsula. Much filamentous green algae present.

9. Site near Arnee Point, L. Ree, Co. Longford (N 100564)
   Gammarus sp. abundant in bed of submerged grass and Juncus sp. Hydra sp. present in sample.

10. Site near Portlick Castle, Co. Westmeath (N 060494)
    Chara sp. covering substrate. Ostracods abundant.

11. Creggan Lough, Co. Westmeath (N 070524)
    Sandy substrate with tall stand of Phragmites sp. Hydra sp. present in sample.

12. Killinure Lough, Co. Westmeath (N 072440)
    This waterbody has a direct connection with the main body of L. Ree. Sampling site near Ballykeeran.

13. Corkip Lough, Co. Roscommon (M 928435)
    Turlough with typical flora of grasses and sedges extending over an area of 77 ha. When sampled a recent decline in water level was evident. Very shallow, less than 1 m. Abundant filamentous algal growth in water. Colony of Black-Headed Gulls (Larus ridibundus L.); also Lapwings (Vanellus vanellus L.) and Coots (Fulica atra L.). Easy access to Lough across pastures from Keoghville.

14. Lough Funshinagh, Co. Roscommon (M 946497)
Fluctuating lake which has occasionally dried up since 1933. Very low water level with dead fish at the "swallow-hole". Mud substrate.

15. Coolagarry Lough, Co. Roscommon (M 900477)
Turlough. Very clear water. Substrate with complete cover of Carex sp. Potentilla sp. and grass. Water level remained high until June, 1986. Level had fallen by 3 - 4 m by 22 June 1986 with Chara and Potomogeton sp. visible in deeper water. Number of minnow fry (Phoxinus phoxinus L.) taken in second June sample.

16. Lough Croan, Co. Roscommon (M 880497)
Turlough which can extend over 10 ha. Cumulative sample taken in guanotrophic main pool and small pools left on surrounding pasture. Nesting colony of several hundred Black-Headed Gulls. Extensive growth of filamentous green algae in water.

Results and discussion

The total cladoceran species list for L. Ree and neighbouring waterbodies is presented in Table 1. The greatest species diversity was found in Creggan Lough (Loc. 11), where twenty one taxa were recorded. This large number contrasts with a total of only nine taxa recorded in Corkip Lough (Loc. 13) which was the most diverse turlough-type habitat. This relatively small number of species is a consequence of the intermittent nature of the waterbodies. Twenty species of Cladocera have been recorded from Knockaunroe Turlough, Co. Clare (Reynolds, 1986). A relatively large number of species is indicative of a waterbody which does not dry up completely but it may undergo large fluctuations in waterlevel every year. The number of species recorded at various locations within the main body of L. Ree ranges from twenty taxa at Arnee Point (Loc. 9) to six taxa near Formoyle (Loc. 6). Creggan Lough (Loc. 11) and the bay at Arnee Point (Loc. 9) offer very favourable habitats for Cladocera, chydorids in particular, because these sites are sheltered and have abundant macrophyte growth. No large difference in the number of taxa was found between habitats with poor macrophyte growth and sandy substrates (Loc. 4, 5, 7) and habitats rich in vegetation (Loc. 1, 2, 3, 6, 8, 9, 10). The average number of taxa recorded at these two groups of locations was 13.6 and 13.2 respectively.

The distribution of certain species within L. Ree and its neighbouring waterbodies is suggestive of specific ecological requirements. Anchistropus emarginatus Sars, which is parasitic on Hydra, was found at four locations (Table 1) including two containing Hydra sp. (near Arnee Point (Loc. 9) and Creggan L. (Loc. 11)). Camptocercus rectirostris Schoedler and Alona intermedia Sars occurred only where Chara sp. was a dominant component of the vegetation at that location (Loc. 4, 8, 10). Graptoleberis testudinaria (Fischer) occurred where there were well developed beds of macrophytes which are essential for its feeding processes (Fryer, 1968). In this study it did not occur in any of the seasonal waterbodies although it has been recorded from Coolefinn Turlough which undergoes large seasonal fluctuations but seldom dries completely (Duigan and Frey, 1987b). Alona affinis (Leydig) had a widespread distribution occurring frequently within L. Ree and also in the turlough-like waterbodies. Ilyocryptus acutifrons Sars is considered rare in Ireland (Fitzmaurice, 1977). It usually occurs in mud and among macrophytes (Scourfield and Harding, 1966). This species has been recorded twice for L. Derg on the R. Shannon (Southern and Gardiner, 1926; Bowman, 1985) and once from L. Keamnacally, Connemara (Fitzmaurice, 1977).

In this study, Eurycercus glacialis Lilljeborg has been recovered from two sites approximately 40 miles north-east of the area in which it was originally discovered (Duigan and Frey, 1987a, b). At one site, Corkip L. this species co-occurs with its sister species Eurycercus lamellatus (O. F. Müller). A previous co-occurence was recorded for Coolefinn Lough (Duigan and Frey, 1987b). To facilitate discrimination between these two species descriptions, illustrated with scanning electron micrographs, were presented in Duigan and Frey (1987a, b). In the majority of locations in north-western Europe E. glacialis occurs where fish are absent because its relatively large size would make it susceptible to fish predation (Frey, 1975). However, on 1 June 1986 at Coolagarry L, sixty five Minnow (Phoxinus phoxinus (L.)) fry were taken in the plankton net. The largest of the fry measured only 19.5 mm in length and it is unlikely that it would be able to prey successfully on the E. glacialis population which was about to become dormant for the summer.

Autumnal and early summer gamogenesis has already been demonstrated for Irish cladoceran populations (Duigan, 1987). The production of ephippia with resting eggs in the autumn ensures population survival despite the low temperatures and food shortages of winter. Ten gamogenetic populations were

identified in L. Ree and Creggan L. on 1 October 1984 (Table 2). Gamogenetic populations of Daphnia pulex (De Geer) and Chydorus sphaericus sensu. str. (O. F. Müller) were found in a semi-permanent hyper-eutrophic pool investigated by McNally (1987) in the Murrough, Co. Wicklow on 14 June 1986 (Duigan, 1987).

Changes in the cladoceran population of Coolagarry L. over a period of two months in the early summer of 1986 were monitored to test if Cladocera living in turloughs adopted a similar survival strategy of producing ephippia which can survive dessication. The results are presented in Table 3. D. pulex was the most abundant component of the sample taken on 25 April 1986 but by 22 June 1986, this species was represented only by ephippia. This species is considered "scarce" in Irish waters (Fitzmaurice, 1977). In previous studies it has been found in shallow pools or lake margins (Scourfield and Harding, 1966). D. pulex was previously recorded in association with E. glacialis in two turloughs in Co. Clare (Duigan and Frey, 1987b). Only Alona rectangula Sars and Chydorus cf. sphaericus have no previous records of co-occurrence with E. glacialis. C. cf. sphaericus is characterised by dimples on its carapace and its taxonomic status is discussed in Duigan and Murray (1987). As a population becomes gamogenetic males usually appear first and then ephippial females (Shan, 1969). This sequence is exhibited by the Alonella excisa (Fischer) population of Coolagarry L. (Table 3). Further investigations will be needed to determine if sexual cladoceran populations in Ireland are dicyclic (i.e. two periods of gamogenesis per year) or strictly monocyclic (i.e. one period of gamogenesis per year). Preliminary studies suggest that several species are capable of becoming gamogenetic in spring or autumn depending on the seasonal nature of the waterbodies in which they occur.

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FIGURE 1. Sampling locations on L. Ree and neighbouring waterbodies.
Location numbers correspond to descriptions in text.

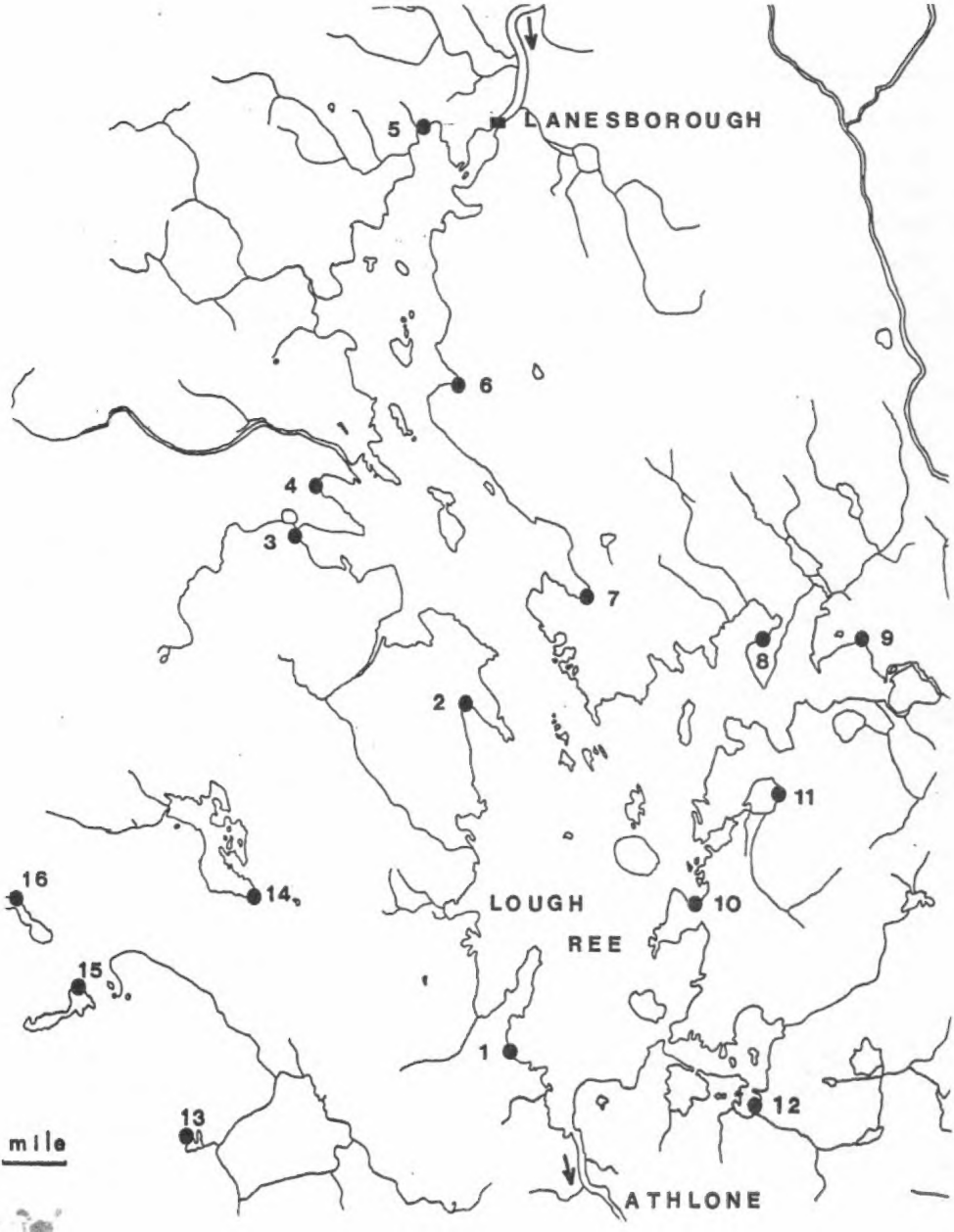

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TABLE 1. Occurrence and distribution of Cladocera within Lough Ree and nearby waterbodies. Location numbers correspond to names and descriptions in text. The final column cites previous records in the literature. K = Kane (1900). F = record by Fitzmaurice in L. Ree (*) and other locations. P = present.

Location Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Lit
Sida crystallina (O.F.M)	P		P	P			P		P		P	P					K,F:*,12
Diaphanosoma brachyurum (Lieven)		P		P					P		P	P					F:*,11
Daphnia sp.				P			P			P	P						
hyalina var. galeata Sars																	K,F:*,11
lacustris Sars																	K
cucullata s.str.Sars																	F:*
longispina O.F.M									P								
pulex (De Geer)															P		
Bosmina sp.	P			P		P	P	P	P								
coregoni s.str.Baird			P	P													F:*
var. obtusirostris(Sars)																	F:*,11,12
longirostris s.str.(O.F.M)											P						F:*,12
Scapholeberis mucronata (O.F.M)												p		p			F:12
Simocephalus vetulus (O.F.M)						P		P		P			P		P	P	
Ceriodaphnia sp.	P		P		P		P	P		P	P	P					
puchella Sars																	F:*,12
reticulata s.str.(Jurine)				P					P								
Lathonura rectirostris (O.F.M.)				P						P					P		
Ilyocryptus acutifrons Sars											P						
Polyphemus pediculus (L.)									P			P					
Bythotrephes longimanus Leydig																	K,F:*
Leptodora kindti (Focke)																	K,F:*

TABLE 1 (Contd.)

Location number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Lit.
Eurycercus lamellatus (O.F.M)	P	P	P	P	P	P	P		P	P	P	P	P			P	F:*,12
glacialis Lilljeborg													P		P		
Graptoleberis testudinaria (Fischer)			P					P	P								
Pleuroxus truncatus (O.F.M)	P	P	P	P				P	P	P	P	P					
laevis Sars				P						P		P					
aduncus (Jurine)			P		P			P	P	P							
trigonellus (O.F.M)	P		P	P					P	P	P	P	P				
uncinatus Baird		P			P												F:*
Anchistropus emarginatus Sars				P	P				P		P						
Monospilus dispar Sars	P	P		P	P	P					P						
Camptocercus rectirostris Schoedler				P						P							
Acroperus harpae (Baird)	P		P	P		P	P	P	P	P	P	P	P				F:*
angustatus Sars																	F:*
Alonopsis elongata Sars	P			P		P											
Alona intermedia Sars					P			P		P							
rectangula Sars		P									P		P				
affinis (Leydig)		P			P	P	P	P		P	P		P	P	P		F:*,12
guttata Sars			P									P					
rustica Scott		P			P												
costata Sars			P	P				P	P	P	P	P					F:12
Alonella nana (Baird)								P	P	P				P			
excisa (Fischer)					P			P		P	P			P	P		
exigua (Lilljeborg)			P						P			P					F:*
Disparalona rostrata (Koch)		P			P				P		P						F:*
Rhynchotalona falcata (Sars)	P	P			P						P						

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TABLE 1 (Contd.)

Location number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Lit.
Chydorus sphaericus s.str. (O.F.M)		P	P	P	P	P		P	P	P	P	P	P		P	P	F:*,12
cf.sphaericus							P		P				P		P		
piger Sars											P						
Pseudochydorus globosus (Baird)	P	P	P	P					P	P	P	P					F:*

TABLE 2. Locations of gamogenetic chydorid populations in Lough Ree and Creggan Lough on 1 October 1984. Gamogenesis was defined as the presence of mature males and/or ephippial females in a population. Location numbers correspond to names and descriptions in text.

	Mature Males	Ephippial Females
Alona costata	8, 10, 11	8
Acroperus harpae	8, 12	
Alonopsis elongata	7	
Pleuroxus truncatus	2	10
uncinatus	2	
Alonella exigua		3
Disparalona rostrata		2
Camptocercus rectirostris		4
Monospilus dispar	11	11
Rhynchotalona falcata	11	

TABLE 3. The occurrence of gamogenetic cladoceran populations in Coolagarry Lough, Co. Roscommon over a three month period in 1986.
P = species represented by parthenogenetic females; EF = ephippial females present in population; M = mature males present in population; E = species recorded by the presence of ephippia only.

	25 April	9 May	1 June	22 June
Daphnia pulex	EF	EF	EF	E
Lathonura rectirostris	P	P	P	
Simocephalus vetulus	P		EF	E
Eurycercus glacialis	P	P	M,EF	P
Alonella excisa	P	M	M,EF	M
Chydorus cf. sphaericus	P	P	EF	EF
Alona affinis			P	

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Reviews

FLORA OF LOUGH NEAGH.

John Harron with the assistance of Brian S. Rushton. 270pp. Published by the Irish Naturalists' Journal Committee, Belfast and the University of Ulster, Coleraine. 1987. IR£6.00, £5.00 Stg, available from Paul Hackney, Irish Naturalists' Journal, Ulster Museum, Botanic Gardens, Belfast BT9 5AB.

This flora is a catalogue of some 800 taxa with annotated distributional data and habitat information. It is based largely on three older floras, The Flora of the North-East of Ireland (1888, 2nd ed. 1938), The Flora of Tyrone (ca. 1942) and The Flora of County Armagh (1893), together with "recent additions from fieldwork up to 1985". No criteria are given to define the area covered by the flora (not even arbitrary boundaries) other than a comment (p. 15) that an attempt has been made "to treat the lakeland as a complete biological unit".

The twelve page introduction opens with a section titled "Topography and Geology". There is in fact little topographic information and the section should perhaps be more appropriately titled Hydrology and Geology. It provides data on lake area, mean depth and a table of water flow in the principal rivers feeding the lake. There follows a brief dynamic description of geological events leading to lake formation in Oligocene times, and subsequent Quaternary events including the development of a raised beach cliff when lake levels were higher.

After a fleeting reference to Tertiary Vegetation, a standard account of post-glacial (specifically post-Atlantic) vegetation history recounts the classical story of Neolithic landnam and eventual intensification of agriculture with the arrival of plantation settlers. A useful summary of drainage schemes undertaken in the nineteenth and twentieth centuries is included along with comments on the impact of such schemes on the local flora.

The final five pages of the introduction give an overview of the character of the vegetation by describing numerous assemblages of plants, grouped according to similarity of habitat requirements, distribution, or response to drainage.

Arrangement and nomenclature of species follows the 3rd edition of the Excursion Flora of the British Isles. However, some subspecific taxa are listed which are not to be found in this latter work. No aids to the differentiation of these taxa are provided.

Distribution maps are presented for almost half of the taxa dealt with, the widespread and very rare species being omitted. A distinction is made between records before and after 1970. The maps therefore give some indication of recent declines in species distributions e.g. the adverse effects of drainage on Subularia aquatica and Calamagrostis stricta are all too apparent. Conversely, notable recent expansions by some species e.g. Polygonum mite and Rorippa sylvestris, cannot be detected in the maps because of draughting constraints.

Despite any such minor deficiencies, this flora remains a valuable catalogue of plant records from the extensive immediate catchment of Lough Neagh (roughly that part below 75 m altitude) from the late seventeenth century to date. The scope of the work is evident in the contained list of record sources which is a comprehensive "Who's Who" of field botanists who have been active in the north of Ireland. Its publication is timely in the light of potential exploitation of extensive lignite deposits about and beneath the lake, and also as a baseline against which the more insidious changes accompanying cultural eutrophication can be measured. It is an essential acquisition for anyone interested in plant recording in Ireland, particularly the north east, and has more general relevance to all biogeographers.

Anthony McNally.

THE IRISH RED DATA BOOK 1 VASCULAR PLANTS

T. G. F. Curtis and H. N. McGough. 168pp. with four colour plates and 30 maps. Wildlife Service Ireland. The Stationary Office, Dublin, 1988. IR£7.00.

Until very recently Ireland was one of only a handful of European countries for which there was no vascular plant red data book, so the arrival of the long-awaited Irish Red Data Book for vascular plants is most welcome in both

Irish and European terms.

The book is a synthesis of what is known of the present distribution, ecology and conservation status of the rare and threatened vascular plants growing wild in Ireland. The book is prefaced by Christine Leon of the Threatened Plants Unit of IUCN's Conservation Monitoring Centre at Kew. She presents a frightening picture of the trend in global plant extinctions (as many as 60,000 species extinct by the year 2050) and emphasises the importance of documentary evidence concerning the status of rare and endangered plants. Introductory and explanatory chapters follow, which outline the need in Ireland for a book such as this, and which explain how the data were collected, collated and analysed.

The species included in the book for special consideration are those that, in the whole of Ireland; (a) occur in ten or less 10 km Irish National Grid squares, (b) have declined by more than 66%, based on their 10 km grid square distribution, (c) are under threat in a European context, though not necessarily in Ireland, and (d) are, or were legally protected either in Northern Ireland or the Republic. An enormous amount of data about these species has been collected by the authors and their collaborators. These data are summarised and presented in the main section of the book as the species accounts. These accounts are concise yet informative and show the extent of research that was required to compile them. This section is very readable and is arranged into groups and sub-groups based on habitat types.

For each of the 159 species considered, the habitat and Irish distribution is given, as well as a comment on their British and European distributions. Also included is a threat number and a related IUCN threat category. The threat number is compiled from six attributes of the plant and its habitat, i.e. number of localities in which the plant occurs, percent decline of the plant since 1970, attractiveness of the plant, site remoteness, accessibility and habitat vulnerability. This provides an objective assessment of how endangered a particular species is. In each account the number of 10 km Irish National Grid squares that a particular species has been seen in, both before and after 1970 is also given. Finally, the occurrence of a rare and threatened species in various types of nature reserves in Northern Ireland and the Republic, for example Nature Reserves, Forest National Nature Reserves, National Parks, Areas of Scientific Interest, National Trust properties,

among others, is indicated.

Twenty eight computer-generated maps of species with interesting biogeographic features or trends are included. These, thankfully plotted on a 10 km square basis using the Irish National Grid, are both clear and very informative and indicate pre- and post-1970 records. Each map appears on a separate page and is of real value, unlike in some works where each map finds itself on a page along with eight or nine others. An added bonus of the book, that by definition as a data book could have been rather dry, is the presence of four delightful colour plates, illustrating 14 species and a view of Mount Brandon in Co. Kerry.

The Irish Red Data Book is, in general, very consistent and accurate, with very few typographical errors. I have, however, some criticisms, mainly concerning omissions from the book. There is no mention of Parapholis incurva (L.) C. E. Hubbard at all, though this grass, recently found new to Ireland appears to be a rare and threatened species. On p. 93 it is stated that Cirsium helenioides (L.) Hill only occurs in Northern Ireland (Co. Fermanagh). Thirty plants were, however seen in about 1963 at L. Gill (probably Leitrim) - see Proc. B.S.B.I. 5: 137 (1963).

The maps are open to criticism by those who have seen a particular species since 1970 in a square where a species is indicated as not having been seen there since 1970. This is hardly a fault of the authors though, whose only crime was that they perhaps justifiably did not cast their information request-net far enough. A session in the herbarium at Trinity (TCD) would certainly have turned up some more post-1970 records, for example Triochomanes from West Donegal, seen in 1976.

I rather regret the exclusion of all apomictic groups from getting the red data treatment. I think that Sorbus species, certainly S. anglica Hedl., S. rupicola (Syme)Hedl. and S. devoniensis E. F. Warb. should have been included. In Ireland these species are very rare, the former only occurring in Killarney. Irish plants are readily distinguishable and surely deserve to have their conservation status assessed.

I do not wish to appear to be too critical of this book because I would recommend it most highly to anyone interested (or even uninterested!) in

Irish biogeography. I shall certainly use it and I would hope that it will be used by others in a constructive way to try and conserve our rare and threatened vascular plant species for future generations.

M. B. Wyse Jackson.

ERRATA

During the printing of Bulletin No. 10, the bottom line of text was accidentally omitted from page 2 of P. J. Chandler's article on fungus gnats. The missing line reads "225 species and altogether 244 species have been collected since 1968. Some".

Due to production difficulties, there are inconsistencies in the format of grid references in Bulletin No. 11. In some papers, there is a space between the letter and figures. In others, this is absent.

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INSTRUCTIONS TO CONTRIBUTORS

1. Manuscripts should follow the format of articles in Bulletin No. 11.

2. Manuscripts should be submitted as typed copy on A4 paper, using double-spacing and 2.5 cm (1 inch) margins.

3. It helps if the copy is clean and not embellished with a mass of super-imposed corrections.

4. Figures should be submitted in a size for reduction to A5 without any loss of detail.

5. Records: please ensure that, at minimum, the following information is incorporated in each record included in a manuscript:-
   (a) latin name of organism.
   (b) statement of reference work used as the source of nomenclature employed in the text. The describer's name should be also given when a zoological species is first mentioned in the text.
   (c) locality details including at least a four figure Irish Grid reference (e.g. M 0978), county, vice-county number and some ecological data about the collection site, plus date of capture.
   (d) collector's name and determiner's name (where different from collector's name), and
   (e) altitude data should be included where relevant.

6. Manuscripts should be submitted to the Editor, Dr. J. P. O'Connor, at the following address:- National Museum of Ireland, Kildare Street, Dublin 2, IRELAND.

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